

UNIVERSITY OF ZAGREB  
FACULTY OF VETERINARY MEDICINE

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Division: Division of Veterinary Public Health and Food Safety

Organizational unit: Unit of Pharmacology and Toxicology

Email of the course leader: bozic@vef.hr

Register no.: 61-10-25/81

Zagreb, 05/09/2025



|                                 |                     |           |  |
|---------------------------------|---------------------|-----------|--|
| 207069                          | REPUBLIKA HRVATSKA  |           |  |
| Veterinarski fakultet u Zagrebu |                     |           |  |
| Primljeno:                      | 05.09.2025          |           |  |
| Klasifikacijska oznaka          | Org. jed.           |           |  |
| 602-04/25-22/34                 | 251-61-41;251-61-32 |           |  |
| Uruđbeni broj                   | Prilozi             | Vrijednos |  |
| 251-61-10-25-54                 | 0                   | -         |  |

## COURSE SYLLABUS

Course name: Pharmacology

Academic year 2025/2026

Course leader: Prof. Frane Božić, PhD

Teachers: Prof. Frane Božić, PhD; Prof. Andreja Prevendar Crnić, PhD; Assistant Nikola Čudina, DVM; Assistant Ena Oster, DVM

Expert associates: Hrvoje Pavasović, DVM

First day of classes: 07/10/2025

Last day of classes: 22/01/2026

| Activities - Pharmacology (1/7) |       |       |              |                                              |                  |      |        |                        |                 |
|---------------------------------|-------|-------|--------------|----------------------------------------------|------------------|------|--------|------------------------|-----------------|
| Start Dat                       | Start | End   | Subject      | Subject                                      | Group            | Note | Length | Instructor             | Room            |
| 07/10/2025                      | 10:00 | 11:30 | Pharmacology | p1 Introduction                              | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 10/10/2025                      | 12:00 | 13:30 | Pharmacology | p2 Pharmacodynamics                          | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 15/10/2025                      | 12:00 | 13:30 | Pharmacology | p3 Pharmacokinetics, drug residues           | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 17/10/2025                      | 8:15  | 9:45  | Pharmacology | v1 Pharmaceutics and Veterinary Dosage Forms | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 17/10/2025                      | 11:45 | 13:15 | Pharmacology | v1 Pharmaceutics and Veterinary Dosage Forms | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 21/10/2025                      | 11:30 | 13:00 | Pharmacology | v2 Evidence-based Pharmacotherapy            | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 22/10/2025                      | 10:00 | 11:30 | Pharmacology | p4 Autonomic nervous system pharmacology     | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 22/10/2025                      | 11:45 | 13:15 | Pharmacology | v2 Evidence-based Pharmacotherapy            | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 28/10/2025                      | 11:30 | 13:00 | Pharmacology | v3 Drug research and development             | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 30/10/2025                      | 10:00 | 11:30 | Pharmacology | v3 Drug research and development             | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |

### Activities - Pharmacology (2/7)

| Start Dat  | Start | End   | Subject      | Subject                                                      | Group            | Note | Length | Instructor                | Room            |
|------------|-------|-------|--------------|--------------------------------------------------------------|------------------|------|--------|---------------------------|-----------------|
| 03/11/2025 | 13:45 | 15:15 | Pharmacology | v4 1st colloquium<br>R&D, Solid drug<br>formulations         | 5E-3             |      | 1:30   | Nastavnici na<br>predmetu | P_farmakologija |
| 04/11/2025 | 13:15 | 14:45 | Pharmacology | p5 Central nervous<br>system:<br>premedication,<br>sedatives | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.                  | P_farmakologija |
| 05/11/2025 | 8:00  | 9:30  | Pharmacology | v4 1st colloquium<br>R&D, Solid drug<br>formulations         | 5E-1, 5E-2       |      | 1:30   | Nastavnici na<br>predmetu | P_farmakologija |
| 11/11/2025 | 10:30 | 12:00 | Pharmacology | p6 Opioid<br>analgesic drugs                                 | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.                  | P_farmakologija |
| 12/11/2025 | 8:15  | 9:45  | Pharmacology | v5 Semisolid drug<br>formulations                            | 5E-1, 5E-2       |      | 1:30   | Nastavnici na<br>predmetu | P_farmakologija |
| 14/11/2025 | 8:15  | 9:45  | Pharmacology | v5 Semisolid drug<br>formulations                            | 5E-3             |      | 1:30   | Nastavnici na<br>predmetu | P_farmakologija |
| 19/11/2025 | 8:15  | 9:45  | Pharmacology | p7 Nonsteroidal<br>anti-inflammatory<br>drugs                | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.                  | P_farmakologija |
| 19/11/2025 | 13:00 | 14:30 | Pharmacology | v6 Liquid drug<br>formulations                               | 5E-3             |      | 1:30   | Nastavnici na<br>predmetu | P_farmakologija |
| 21/11/2025 | 8:15  | 9:45  | Pharmacology | v6 Liquid drug<br>formulations                               | 5E-1, 5E-2       |      | 1:30   | Nastavnici na<br>predmetu | P_farmakologija |
| 25/11/2025 | 8:15  | 9:45  | Pharmacology | v7 2nd colloquium,<br>Drug dosing and<br>prescribing 1       | 5E-3             |      | 1:30   | Nastavnici na<br>predmetu | P_farmakologija |

F. B. 2

### Activities - Pharmacology (3/7)

| Start Dat  | Start | End   | Subject      | Subject                                              | Group            | Note | Length | Instructor             | Room            |
|------------|-------|-------|--------------|------------------------------------------------------|------------------|------|--------|------------------------|-----------------|
| 25/11/2025 | 9:55  | 11:25 | Pharmacology | v7 2nd colloquium, Drug dosing and prescribing 1     | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 25/11/2025 | 11:30 | 13:00 | Pharmacology | p8 Anticholinergic and myorelaxant drugs             | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 26/11/2025 | 8:15  | 9:45  | Pharmacology | v8 Drug dosing and prescribing 2                     | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 28/11/2025 | 8:15  | 9:45  | Pharmacology | v8 Drug dosing and prescribing 2                     | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 01/12/2025 | 9:30  | 11:00 | Pharmacology | p9 Local and general anesthetics, neuroleptanalgesia | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 01/12/2025 | 11:30 | 13:00 | Pharmacology | v9 Drug dosing and prescribing 3                     | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 01/12/2025 | 13:15 | 14:45 | Pharmacology | v9 Drug dosing and prescribing 3                     | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 02/12/2025 | 12:15 | 13:45 | Pharmacology | v10 Drug dosing and prescribing 4                    | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 04/12/2025 | 13:45 | 15:15 | Pharmacology | v10 Drug dosing and prescribing 4                    | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 05/12/2025 | 10:30 | 12:00 | Pharmacology | v11 Drug dosing and prescribing 5                    | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 08/12/2025 | 9:00  | 10:30 | Pharmacology | p10 Antiepileptics                                   | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |

### Activities - Pharmacology (4/7)

| Start Dat  | Start | End   | Subject      | Subject                                        | Group            | Note | Length | Instructor             | Room            |
|------------|-------|-------|--------------|------------------------------------------------|------------------|------|--------|------------------------|-----------------|
| 08/12/2025 | 12:30 | 14:00 | Pharmacology | v11 Drug dosing and prescribing 5              | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 11/12/2025 | 8:00  | 9:30  | Pharmacology | v12 Repetition for colloquium                  | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 12/12/2025 | 8:15  | 9:45  | Pharmacology | p11 Glucocorticoids                            | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 12/12/2025 | 13:30 | 15:00 | Pharmacology | v12 Repetition for colloquium                  | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 17/12/2025 | 8:15  | 9:45  | Pharmacology | v13 Laboratory animals movies                  | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 17/12/2025 | 12:00 | 13:30 | Pharmacology | v13 Laboratory animals movies                  | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 19/12/2025 | 11:45 | 13:15 | Pharmacology | p12 Cardiovascular pharmacology                | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 22/12/2025 | 9:00  | 9:45  | Pharmacology | v14 3rd colloquium                             | 5E-1, 5E-2, 5E-3 |      | 0:45   | Nastavnici na predmetu | P_farmakologija |
| 23/12/2025 | 8:15  | 9:45  | Pharmacology | v15 Pharmacology problem solving 1a            | 5E-2             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 23/12/2025 | 10:00 | 11:30 | Pharmacology | p13 Pharmacology of the gastrointestinal tract | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 23/12/2025 | 12:00 | 13:30 | Pharmacology | v15 Pharmacology problem solving 1a            | 5E-1, 5E-3       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |

| Activities - Pharmacology (5/7) |       |       |              |                                                                 |                  |      |        |                        |                 |
|---------------------------------|-------|-------|--------------|-----------------------------------------------------------------|------------------|------|--------|------------------------|-----------------|
| Start Dat                       | Start | End   | Subject      | Subject                                                         | Group            | Note | Length | Instructor             | Room            |
| 07/01/2026                      | 10:30 | 12:00 | Pharmacology | p14 Pharmacology of the respiratory system                      | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 08/01/2026                      | 13:00 | 14:30 | Pharmacology | v16 Pharmacology problem solving 1b                             | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 09/01/2026                      | 11:15 | 12:45 | Pharmacology | p15 Introduction to chemotherapeutics                           | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 12/01/2026                      | 11:00 | 12:30 | Pharmacology | p16 Beta-lactam antibiotics                                     | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 12/01/2026                      | 12:45 | 14:15 | Pharmacology | v16 Pharmacology problem solving 1b                             | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 14/01/2026                      | 8:15  | 9:45  | Pharmacology | p17 Aminoglycosides, aminocyclitols and polypeptide antibiotics | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 15/01/2026                      | 8:15  | 9:45  | Pharmacology | v17 Pharmacology problem solving 2a                             | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 15/01/2026                      | 10:00 | 11:30 | Pharmacology | p18 Macrolides, lincosamides, tetracyclines and pleuromutilins  | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 15/01/2026                      | 11:45 | 13:15 | Pharmacology | v17 Pharmacology problem solving 2a                             | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |

F. A. Z.

### Activities - Pharmacology (6/7)

| Start Dat  | Start | End   | Subject      | Subject                                                           | Group            | Note | Length | Instructor             | Room            |
|------------|-------|-------|--------------|-------------------------------------------------------------------|------------------|------|--------|------------------------|-----------------|
| 16/01/2026 | 10:45 | 12:15 | Pharmacology | p19 Fluoroquinolones, amphenicols, sulfonamides and metronidazole | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 16/01/2026 | 12:30 | 14:00 | Pharmacology | v18 Pharmacology problem solving 2b                               | 5E-1, 5E-2       |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 19/01/2026 | 10:00 | 11:30 | Pharmacology | p20 Antiprotozoal drugs                                           | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_fiziologija   |
| 19/01/2026 | 11:45 | 13:15 | Pharmacology | v18 Pharmacology problem solving 2b                               | 5E-3             |      | 1:30   | Nastavnici na predmetu | P_farmakologija |
| 20/01/2026 | 9:30  | 11:00 | Pharmacology | p21 Antitrematodal, anticestodal and antitrematodal drugs         | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 20/01/2026 | 11:15 | 12:45 | Pharmacology | s01 Drug allergies                                                | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 21/01/2026 | 8:15  | 9:45  | Pharmacology | p22 Ectoparasitocides                                             | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 21/01/2026 | 10:00 | 11:30 | Pharmacology | s02 Intramammary formulations for bovine mastitis treatment       | 5E-1, 5E-2, 5E-3 |      | 1:30   | Božić F.               | P_farmakologija |
| 22/01/2026 | 10:45 | 11:30 | Pharmacology | p23 Antimycotics                                                  | 5E-1, 5E-2, 5E-3 |      | 0:45   | Božić F.               | P_farmakologija |

F. 7. 2

## Activities - Pharmacology (7/7)

| Start Dat  | Start | End   | Subject      | Subject                  | Group            | Note | Length | Instructor   | Room            |
|------------|-------|-------|--------------|--------------------------|------------------|------|--------|--------------|-----------------|
| 22/01/2026 | 11:45 | 12:30 | Pharmacology | s03<br>Pharmacovigilance | 5E-1, 5E-2, 5E-3 |      | 0:45   | Pavasović H. | P_farmakologija |
| Total: 61  |       |       |              |                          |                  |      | 89:15  |              |                 |

F. H. 2

**STUDENT OBLIGATIONS**

|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture attendance                              | <p>45 hours (3-6 points)<br/> 1 hour of lectures = 0.13 points<br/> Minimum required is 3 points (equivalent to 23 hours of lecture attendance from maximum of 45)</p>                                                                                                                                                                                                                                                                                                  |
| Seminars attendance                             | <p>5 hours (4,8-6 points)<br/> 1 hour of seminar is 1.2 points<br/> Minimum required is 4 points (equivalent to 4 hours of seminars' attendances from maximum of 5)</p>                                                                                                                                                                                                                                                                                                 |
| Practicals attendance                           | <p>35 hours (4,8-6 points)<br/> 1 hour of practicals attendance is 0.171 points<br/> Minimum required is 4 points (equivalent to 25 hours of practicals attendances from maximum of 35)</p>                                                                                                                                                                                                                                                                             |
| Active participation in seminars and practicals | <p><b>Seminars:</b> oral presentations or written seminars are evaluated and scored (min. 2,5 points, max.5 points)<br/> <b>Practicals:</b> Student effort and the engagement during pharmacology problem solving is evaluated and scored (min 2.5 points, max. 5 points)</p>                                                                                                                                                                                           |
| Final exam                                      | <p>Oral exam, lectures<br/> Minimum required exam entry are 36 points (from maximum of 60).</p>                                                                                                                                                                                                                                                                                                                                                                         |
| Examination requirements                        | <p>Student requirements are defined in the Regulations on the Integrated Undergraduate and Graduate Study of Veterinary Medicine (2024). Given the above, the student must acquire a minimum number of points from all assessment elements in order to take the final exam. <b>Regulations On Intergraduate And Graduate Studies, Article 41:</b> a student can justifiably be absent from up to 50% of the lectures; 30% of the seminars and 30% of the exercises.</p> |

**GRADING AND EVALUATING STUDENT WORK**

|                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Continuous knowledge-checking (mid-terms) | <p>3 colloquiums:</p> <ol style="list-style-type: none"> <li>1) Principles of Pharmaceutics, Drug R&amp;D (max. 10 points, min. 6 points)<br/>Dates of colloquiums: 03.11.2025. and 05.11.2025.</li> <li>2) Drug Dosage Forms (max. 8 points, min. 5 points)<br/>Date of colloquiums: 25.11.2025.</li> <li>3) Drug prescribing (max. 14 points, min. 9 points)<br/>Date of colloquiums: 22.12.2025.</li> </ol> <p>A student who does not achieve the minimum number of points from each colloquium has the right to a remedial colloquium, which will be organized during last practical</p> |
| Final exams (dates)                       | 17/12/2025., 5/02/2026., 19/02/2026.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Form of final exam                        | Oral exam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**LITERATURE**

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Obligatory literature | Course materials (lecture handouts and notes) will be provided for every student (Merlin)                                                                                                                                                                                                                                                                                                                                                                                                          |
| Optional literature   | <ol style="list-style-type: none"> <li>1. Riviere, J., M. Papich (2018): Veterinary Pharmacology and Therapeutics, 8th ed. Wiley Blackwell.</li> <li>2. Maddison, Page and Church (2008): Small Animal Clinical Pharmacology. 2nd ed. Saunders Elsevier.</li> <li>3. Papich, M.G. (2011): Saunders Handbook of Veterinary Drugs. 3rd Ed. Elsevier Saunders.</li> <li>4. Booth D. M. (2012): Small animal Clinical Pharmacology, Elsevier (Saunders) 2nd ed., St. Louis, Missouri 63043.</li> </ol> |

### OBJECTIVES AND LEARNING OUTCOMES

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Course objectives | Based on knowledge gained upon the completed course and passed the exam "General and special pharmacology" students will be able to understand pharmacological basis of medical effects as well as species, age and other factors impacting on it. Besides, students will gain knowledge of effecting mechanisms of particular drug groups and will be able to choose the most appropriate drug (or drugs) indicated for specific disease or a pathological state. While doing so they will know to apply the drug in its optimal dose according to prescribed dose, while in the case of possible combination of a couple of drugs they will be aware of their mutual effects on each other (desirable or undesirable). Students will particularly learn to approach specific species and categories of animals individually, but to treat farm animals as a group, as well. As regard that an animal should be get rid of pain in any moment it suffers, students will learn mechanisms of pain occurrence and its importance as well as the meaning of "multimodal pain therapy" concept. |
| Learning outcomes | <ol style="list-style-type: none"> <li>1. choose the most suitable drug(s) indicated for a specific disease or pathological condition, taking into account species, age and other factors</li> <li>2. differentiate the treatment approach with regard to the categories of animals (individual and group treatment)</li> <li>3. choose pharmacotherapy in the optimal dose, dosing regimen and method of application</li> <li>4. prescribe and dispense medicines correctly and responsibly in accordance with legislation and latest guidance</li> <li>5. choose the appropriate analgesic therapy within the framework of multimodal pain therapy</li> <li>6. access the appropriate sources of data on licensed medicines</li> <li>7. explain the process of research and development of a new drug</li> <li>8. describe and explain the general principles of pharmacodynamics and pharmacokinetics</li> <li>9. report suspected adverse reactions of medicines through the appropriate channel</li> </ol>                                                                              |

**GRADING SCHEME**

| <i>Points</i> | <i>Grade</i> |
|---------------|--------------|
| Up to 59      | 1 (F)        |
| 60-68         | 2 (E)        |
| 69-76         | 2 (D)        |
| 77-84         | 3 (C)        |
| 85-92         | 4 (B)        |
| 93-100        | 5 (A)        |

Course leader:  
Prof. Frane Božić, PhD



Head of Department:  
Prof. Andreja Prevendar Crnić, PhD



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