



UNIVERSITY OF ZAGREB  
FACULTY OF VETERINARY MEDICINE  
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Division: VETERINARY PUBLIC HEALTH AND FOOD SAFETY  
Department: Department of Hygiene, Technology and Food Safety  
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Register no.:

File no.:

Zagreb, 24<sup>th</sup> August 2021



|                                 |                    |            |
|---------------------------------|--------------------|------------|
| 129626                          | REPUBLIKA HRVATSKA |            |
| Veterinarski fakultet u Zagrebu |                    |            |
| Primljeno:                      | 06.09.2021         |            |
| Klasifikacijska oznaka          | Org. jed.          |            |
| 605-03/21-04/31                 | 251-61-32;         |            |
| Urudžbeni broj                  | Prilozi            | Vrijednost |
| 251-61-17-21-14                 | 0                  | -          |

## COURSE SYLLABUS

Course name: Food Hygiene and Technology

Academic year 2021-22

Course leader: assoc. prof. Nevijo Zdolec

Teachers: prof. Željka Cvrtila, prof. Lidija Kozačinski, assoc. prof. Nevijo Zdolec

Associate teachers: Tomislav Mikuš, PhD, Marta Kiš, DVM

First day of classes: 26<sup>th</sup> October 2021

Last day of classes: 22<sup>th</sup> December 2021

Timetable for LECTURES academic year 2021-2022

| LECTURES   |                             |                            |  |  |
|------------|-----------------------------|----------------------------|--|--|
| Date       | Methodological unit         | Teacher                    | Location / time  | Literature   |
| 26/10/2021 | Introduction FH VPH         | assoc. prof. Nevijo Zdolec | 10-12 h<br>Lecture Room Department of Microbiology and Infectious Diseases with Clinic | Smulders et al. (2012): Toward Harmonization of the European Food Hygiene/Veterinary Public Health Curriculum. <i>JVME</i> 39(2), 169-179.<br>OIE (2013): Veterinary Education Core Curriculum OIE Guidelines.<br>OIE (2012): OIE recommendations on the Competencies of graduating veterinarians ('Day 1 graduates') to assure National Veterinary Services of quality.<br>ECVPH: Bylaw on Residency Training in the European College of Veterinary Public Health (ECVPH) |
| 27/10/2021 | Animal welfare at slaughter | Tomislav Mikuš, PhD        | 10-12 h<br>Lecture Room Department of Microbiology and Infectious Diseases with Clinic | Collins, D. S., R. J. Huey (2015): <i>Graceys Meat Hygiene</i> 11th edition, John Wiley & Sons Ltd, Chichester, UK pp 135-158<br>Purslow, P. P. (2017): <i>New Aspects of Meat Quality From Genes to Ethics</i> , Woodhead Publishing, Cambridge, UK pp 537-577  |
| 03/11/2021 | Slaughter processing        | assoc. prof. Nevijo Zdolec | 12-14 h<br>Lecture Room Department of Physics and Biophysics                           | Ninios et al. (2014): Meat inspection and control in the slaughterhouse. <i>The Slaughter Process</i> , pp 29-43. Wiley Blackwell.   |
| 04/11/2021 | Meat Biochemistry           | prof. Željka Cvrtila       | 14-16 h<br>Lecture Room Department of Microbiology                                     | Toldra, F. (2017): <i>Lawrie's meat science</i> . Eighth edition. <i>Chemical and Biochemical Constitution of Muscle</i> , pp 99-132. Elsevier.  |
| 08/11/2021 | Risk based meat inspection  | assoc. prof. Nevijo        | 8-10 h   | Ninios et al. (2014): Meat inspection  |

|            |   |                            |   |   |
|------------|---|----------------------------|---|---|
|            |   | Zdolec                     | Lecture Room Department of Chemistry and Biochemistry             | and control in the slaughterhouse. Risk-Based Meat Inspection, pp 157-161. Wiley Blackwell.<br>EFSA: Scientific Opinions on Meat Inspection.<br><a href="https://www.efsa.europa.eu/en/topics/topic/meat-inspection">https://www.efsa.europa.eu/en/topics/topic/meat-inspection</a> |
| 09/11/2021 | Meat assessment   | assoc. prof. Nevijo Zdolec | 10-12 h<br>Lecture Room Department of Physiology and Radiobiology | Ninios et al. (2014): Meat inspection and control in the slaughterhouse. Public Health Hazards, Biological Hazards, pp 277-349. Wiley Blackwell.  |
| 19/11/2021 | Food Microbiology: Foodborne Infections and Intoxications | prof. Lidija Kozačinski    | 8-10 h<br>Lecture Room Department of Chemistry and Biochemistry   | Rovira J., A. Cencic, E. Santos, M. Jakobsen (2007): Biological hazards. In: Safety in the agri-food chain. Luning, P.A., F. Devlieghere, R. Verhé (eds). Wageningen Academic Publishers. Pp 67-136.  |
| 22/11/2021 | Chemical-toxicological hazards                            | prof. Željka Cvrtila       | 14-16 h<br>Lecture Room Department of Physiology and Radiobiology | Toldra, F. (2017): Lawrie's meat science. Eighth edition. Chemical contaminants and residues, pp 554-567. Elsevier.   |
| 29/11/2021 | Prerequisite programmes                                   | assoc. prof. Nevijo Zdolec | 12-14 h<br>Lecture Room Department of Physiology and Radiobiology | Ninios et al. (2014): Meat inspection and control in the slaughterhouse. Cleaning and Disinfection, Pest Control, Working Hygiene, Traceability, Own-Check System, pp 453-538. Wiley Blackwell.   |
| 30/11/2021 | HACCP   | prof. Lidija Kozačinski    | 8-10 h<br>Lecture Room Department of Microbiology and Infectious  | Rovira J., A. Cencic, E. Santos, M. Jakobsen (2007): Biological hazards. In: Safety in the agri-food  |

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|------------|--|-------------------------|--|---|
|            |  |                         | Diseases with Clinic   | chain. Luning, P.A., F. Devlieghere, R. Verhé (eds). Wageningen Academic Publishers. Pp 67-136.   |
| 01/12/2021 | Official controls                          | prof. Lidija Kozačinski | 14-16 h<br>Lecture Room Department of Microbiology and Infectious Diseases with Clinic | Ninios et al. (2014): Meat inspection and control in the slaughterhouse. Official control. Pp 553-626 Wiley Blackwell.<br>REGULATION (EU) 2017/625 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 March 2017 on official controls and other official activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products...<br>COMMISSION IMPLEMENTING REGULATION (EU) 2019/627 of 15 March 2019 laying down uniform practical arrangements for the performance of official controls on products of animal origin intended for human consumption in accordance with Regulation (EU) 2017/625 of the European Parliament and of the Council and amending Commission Regulation (EC) No 2074/2005 as regards official controls |
| 07/12/2021 | Meat quality and meat conservation methods | prof. Željka Cvrtila    | 10-12 h<br>Lecture Room Department of Microbiology and Infectious Diseases with Clinic | Toldra, F. (2017): Lawrie's meat science. Eighth edition. Development of meat quality attributes, pp 175-182.<br>The Storage and Preservation   |

|            |                             |                          |  |   |
|------------|-----------------------------|--------------------------|--|---|
|            |                             |                          |  | of Meat, pp 205-259. Elsevier.  |
| 09/12/2021 | Carcass grading and cutting | prof. Lidija Kozračinski | 10-12 h<br>Lecture Room Department of Microbiology and Infectious Diseases with Clinic | REGULATION (EU) 2017/1182 of 20 April 2017 supplementing Regulation (EU) No 1308/2013 of the European Parliament and of the Council as regards the Union scales for the classification of beef, pig and sheep carcasses and as regards the reporting of market prices of certain categories of carcasses and live animals<br>REGULATION (EU) 178/2002 - general food law regulation<br>Toldra, F. (2010): Handbook of Meat Processing. Technologies Pp 5-245. Products Pp 301-439. Blackwell Publishing<br>Ockerman, H.W., L. Basu, F. Toldra (2017): Edible By-products. In: Lawrie's Meat Science, Eighth Edition. F. Toldra (ed), Elsevier Ltd. Pp 679-693 |
| 14/12/2021 | Additives                   | prof. Željka Cvrtila     | 12-14 h<br>Lecture Room Department of Physiology and Radiobiology                      | Tarte, R. (2009): Ingredients in Meat Products. Springer.   |
| 16/12/2021 | Meat Processing             | prof. Željka Cvrtila     | 12-14 h<br>Lecture Room Department of Physiology and Radiobiology                      | Toldra, F. (2017): Lawrie's meat science. Eighth edition. Chemical and Biochemical Constitution of Muscle, pp 99-132. Elsevier.   |

## Timetable for PRACTICALS academic year 2021-2022

| PRACTICALS |   |   |                             |  |  |
|------------|---|---|-----------------------------|--|--|
| Date       | Methodological unit   | Teacher                                     | Type of practical           | Location / time  | Literature   |
| 05/11/2021 | Ante mortem, transport, welfare Slaughterhouse construction, waste- | Tomislav Mikuš, PhD<br>prof. Željka Cvrtila | Special clinical practicals | 12-15 h<br>Department of Hygiene, Technology and Food Safety | Collins, D. S., R. J. Huey (2015): <i>Graceys Meat Hygiene</i> 11th edition, John Wiley & Sons Ltd, Chichester, UK (pp.113-158)<br>Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport and related operations<br>EC recommendations on Animal welfare during transport (project <i>Animal Transport Guides</i> ) |
| 08/11/2021 | Food sampling<br>Sensorial analysis                                 | prof. Željka Cvrtila                        | Laboratory practicals       | 14-16 h<br>Department of Hygiene, Technology and Food Safety | Kozačinski et al. (2021): <i>Handbook of laboratory practicals in Food Hygiene and Technology</i> . Faculty of Veterinary Medicine, UNIZG.   |
| 09/11/2021 | Water holding capacity, pigments                                    | prof. Željka Cvrtila                        | Laboratory practicals       | 12-14 h<br>Department of Hygiene, Technology and Food Safety | Kozačinski et al. (2021): <i>Handbook of laboratory practicals in Food Hygiene and Technology</i> . Faculty of Veterinary Medicine, UNIZG.   |
| 09/11/2021 | Meat inspection   | assoc. prof. Nevijo Zdolec                  | Special clinical practicals | 14-17 h<br>Department of Hygiene, Technology and Food Safety | Ninios et al. (2014): <i>Meat inspection and control in the slaughterhouse. Post-Mortem Inspection and Related Anatomy</i> , pp 73-154. Wiley Blackwell.<br>Collins, D.S., R.J. Huey (2015):   |

|            |   |                            |                             |  |   |
|------------|---|----------------------------|-----------------------------|--|---|
|            |   |                            |                             |  | Gracey's Meat Hygiene. Meat Inspection protocols. pp 185-222. Wiley Blackwell   |
| 15/11/2021 | Meat freshness  | Tomislav Mikuš, PhD        | Laboratory practicals       | 9-12 h<br>Department of Hygiene, Technology and Food Safety  | Kozačinski et al. (2021): Handbook of laboratory practicals in Food Hygiene and Technology. Faculty of Veterinary Medicine, UNIZG.  |
| 16/11/2021 | Field course (cattle, pig slaughterhouse) 1                                       | Tomislav Mikuš, PhD        | Special clinical practicals | 8-15 h<br>VAJDA  | Ninios et al. (2014): Meat inspection and control in the slaughterhouse. Wiley Blackwell  |
| 17/11/2021 | Food Microbiology   | Marta Kiš, DVM             | Laboratory practicals       | 9-12 h<br>Department of Hygiene, Technology and Food Safety  | Kozačinski et al. (2021): Handbook of laboratory practicals in Food Hygiene and Technology. Faculty of Veterinary Medicine, UNIZG.<br>Ray, B., A. Bhunia (2014): Fundamental Food Microbiology. 5th edition. CRC Taylor & Francis, USA. |
| 25/11/2021 | Microbiological cleanliness<br>Interpretation of microbiological analyses of food | assoc. prof. Nevijo Zdolec | Laboratory practicals       | 11-14 h<br>Department of Hygiene, Technology and Food Safety | Kozačinski et al. (2021): Handbook of laboratory practicals in Food Hygiene and Technology. Faculty of Veterinary Medicine, UNIZG.  |
| 26/11/2021 | Field course (cattle, pig slaughterhouse)   | assoc. prof. Nevijo Zdolec | Special clinical practicals | 8-15 h<br>VAJDA  | Ninios et al. (2014): Meat inspection and control in the slaughterhouse. Wiley Blackwell  |
| 30/11/2021 | Interpretation of microbiological cleanliness testing<br>Fat quality              | Tomislav Mikuš, PhD        | Laboratory practicals       | 12-15 h<br>Department of Hygiene, Technology and Food Safety | Kozačinski et al. (2021): Handbook of laboratory practicals in Food Hygiene and Technology. Faculty of Veterinary Medicine, UNIZG.  |

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|------------|---|----------------------------|-----------------------------|---|---|
| 02/12/2021 | Field course (poultry slaughterhouse)                         | Marta Kiš, DVM             | Special clinical practicals | 7-14 h<br>PIPO ČK   | Ninios et al. (2014): Meat inspection and control in the slaughterhouse. Wiley Blackwell  |
| 03/12/2021 | AMR Antimicrobial effect of spices/herbs from food            | Marta Kiš, DVM             | Laboratory practicals       | 14-16,30 h<br>Department of Hygiene, Technology and Food Safety | Kozačinski et al. (2021): Handbook of laboratory practicals in Food Hygiene and Technology. Faculty of Veterinary Medicine, UNIZG.  |
| 17/12/2021 | Results of AMR and spices testing                             | Marta Kiš, DVM             | Laboratory practicals       | 12-13 h<br>Department of Hygiene, Technology and Food Safety    | Kozačinski et al. (2021): Handbook of laboratory practicals in Food Hygiene and Technology. Faculty of Veterinary Medicine, UNIZG.  |
| 20/12/2021 | Ground meat and fresh meat products, spices                   | prof. Željka Cvrtila       | Laboratory practicals       | 13-15 h<br>Department of Hygiene, Technology and Food Safety    | Kozačinski et al. (2021): Handbook of laboratory practicals in Food Hygiene and Technology. Faculty of Veterinary Medicine, UNIZG.  |
| 21/12/2021 | Thermally untreated meat products: safety and quality testing | assoc. prof. Nevijo Zdolec | Laboratory practicals       | 13-16 h<br>Department of Hygiene, Technology and Food Safety    | Zdolec, N. (2017): Fermented Meat Products: Health Aspects. CRC Press, Taylor&Francis, USA.<br>Kozačinski et al. (2021): Handbook of laboratory practicals in Food Hygiene and Technology. Faculty of Veterinary Medicine, UNIZG. |
| 22/12/2021 | Thermally treated meat products: safety and quality testing   | Marta Kiš, DVM             | Laboratory practicals       | 12-15 h<br>Department of Hygiene, Technology and Food Safety    | Kozačinski et al. (2021): Handbook of laboratory practicals in Food Hygiene and Technology. Faculty of Veterinary Medicine, UNIZG.  |



**STUDENT OBLIGATIONS**

|   |  |
|---|--|
| Lecture attendance                              | Classes are held during 60 hours of lectures. In order to achieve a minimum of 3 points, a student should attend 30 hours of lectures. Attendance at one hour of lectures is scored with 0.1 points (a maximum of 6 points can be collected, or 60 hours x 0.1 points).  |
| Seminars attendance                             | -  |
| Practicals attendance                           | Classes are held through 105 hours of exercises. In order to achieve the minimum number of points (8), the student should be present in 74 hours of exercises (of which 48 hours of field exercises (including preparation courses) and 57 hours of laboratory exercises). The maximum number of points that can be collected during 105 hours of exercises is 12.                                       |
| Active participation in seminars and practicals | The maximum number of points that a student can collect is 10. To achieve this, he/she must collect a maximum of 5 points per semester for preparation for the exercise and positive answers during field and laboratory exercises (each activity is 2.5 points). The minimum number of points that a student should collect per semester is 2.5.  |
| Final exam                                      | The final exam includes all the results of monitoring activities during classes. The exam is oral. At the oral exam, the student answers 10 questions, with each correct answer being scored with 4 points. The maximum number of points for the oral exam is 40. The minimum number of points is 24, and for a student to achieve them, he/she must answer at least 6 questions (24 points) correctly.  |
| Examination requirements                        | Student requirements are defined in the Regulations on the Integrated Undergraduate and Graduate Study of Veterinary Medicine. 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 45:</b> 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) | The student must attend the first organized term of the test. In case of justified absence (medical proof), the student can access the remedial test.<br>The first preliminary test (end of the IX sem) covers teaching units referring to veterinary control in meat production (4 questions) and lab exercises (4 questions). The second preliminary test (X sem) covers veterinary inspection, control and examination of milk, fish, eggs, honey and other foodstuffs and technological processing in production of milk, fish, eggs, honey and other foodstuffs (4 questions) and lab exercises (4 questions). |
| Final exams (dates)                       | 09.11., 14.12.2021., 28.01., 11.02.2022.  |
| Form of final exam                        | Oral exam   |

LITERATURE

|                       |  |
|-----------------------|--|
| Obligatory literature | <p><b>Kozačinski et al. (2021):</b> Handbook of laboratory practicals in Food Hygiene and Technology. Faculty of Veterinary Medicine, UNIZG. In press.</p> <p><b>Ninios, N., J. Lunden, H. Korkeala, M. Fredriksson-Ahoma (2014):</b> Meat inspection and control in the slaughterhouse. Wiley Blackwell.</p> <p><b>D.S. Collins, R. J. Huey (2015):</b> Gracey's Meat hygiene. 11th edition. A John Wiley &amp; Sons, Ltd., Publication, 2015.</p> <p><b>Ray, B., A. Bhunia (2014):</b> Fundamental Food Microbiology. 5th edition. CRC Taylor &amp; Francis, USA.</p> <p><b>Borda, D., A. I. Nicolau, P. Raspor (2018):</b> Trends in Fish Processing Technologies. CRC Taylor &amp; Francis, USA.</p> <p><b>Chandan, C.R., A. Kilara, N. P. Shah (2008):</b> Dairy Processing &amp; Quality Assurance. A John Wiley &amp; Sons, Ltd., Publication, 2008.</p> <p><b>G.C. Mead (2004):</b> Poultry meat processing and quality. CRC Press. 2004.</p> <p><b>Sutherland J. P., A. H. Varnam, M. G. Evans (1986):</b> A colour Atlas of food quality control. A Wolfe Science Book.</p> <p><b>Zdolec, N. (2017):</b> Fermented Meat Products: Health Aspects. CRC Taylor &amp; Francis, USA.</p> |
| Optional literature   | <p>REGULATION (EC) No 178/2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety</p> <p>REGULATION (EC) No 852/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the hygiene of foodstuffs</p> <p>REGULATION (EC) No 853/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL laying down specific hygiene rules of food of animal origin</p> <p>REGULATION (EU) 2017/625 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on official controls and other official activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products</p>  |

**OBJECTIVES AND LEARNING OUTCOMES**

|                   |   |
|-------------------|---|
| Course objectives | In addition to the general aim and tasks, the education of future Doctor of Veterinary Medicine has a special aim. It is the task of lecturers to teach the students how to perform independently all expert activities, and to apply the scientifically verified standards of hygiene and technology within the frameworks of the veterinary inspection and evaluation of food safety and quality. Of course, this is possible only by means of education in the field of application of process methods (technology) in the production of food products of high quality and hygiene standards, all in the context of improvement of veterinary public health.   |
| Learning outcomes | By the completion of the course students should be able to: <ul style="list-style-type: none"><li>- explain the structure, purpose and methods of veterinary inspection, control and monitoring of production, processing and distribution of food of animal origin</li><li>- identify hazards and risks in the production and distribution of food of animal origin</li><li>- interpret the results of food quality assessment and food safety</li><li>- distinguish the type of food according to the production process</li><li>- define acceptability factors of food for human consumption</li><li>- incorporate legislation in the preparation and analysis reports in the field of hygiene and technology of food of animal origin</li><li>- evaluate production hygiene procedures in the facility and process control indicators</li></ul> |

**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:



Head of Department/Clinic:



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