



University "Ss. Cyril and Methodius" - Skopje
FACULTY OF VETERINARY MEDICINE - SKOPJE



STUDY GUIDE

**for the doctoral (PhD) studies in third cycle of Veterinary
Medicine - module Food Safety on the Faculty of Veterinary
Medicine - Skopje**

1. INTRODUCTION

In order to comply with the new Law of Higher Education (Official Gazette no. 35/2008 and no. 103/2008) and implementing the recommendations of the Bologna Declaration, Teaching and Scientific council of the Faculty of Veterinary Medicine Skopje (FVMS) decided to implement a program for doctoral studies of third cycle in the field of veterinary medicine - module Food safety for obtaining the title of Ph.D.

The study program is implemented within the School of Doctoral Studies at the University "Ss. Cyril and Methodius". Given that this program is no longer organized by specializations in which the mobility of students was hampered or limited, students will get significantly greater mobility in selecting courses for the content of which they will be interested and in tune with the theme of their doctoral thesis.

New doctoral studies provide designing curriculum depending on the specifics of the theme of the candidate, the current research activities of the institution, as well as the future professional engagement of the candidate. The study program will be organized as a program for PhDs in order to educate researchers showing greater interest in food safety as a profession, and for researchers who want to connect veterinary science with practice by which they will acquire academic qualifications for work in certain subspecialties related with food safety.

Besides the "internal mobility" these doctoral studies are an opportunity for mobility to other, related programs and faculties within the university. At the European veterinary faculties is emphasizes the need for adoption of joint programs for doctoral studies (Baljer, G. et al., Journal of Veterinary Medical Education 31 (3), 239-241, 2004). As a result of the previously mentioned need for cooperation, in future perspectives are opened for cooperation in joint doctoral programs with the veterinary faculties in Europe (joint study program).

New doctoral studies are an integral part of the new model for building a career which gives a better perspective for the future researchers on their individual development and an opportunity for bigger choice in the early stage of their professional career. Upon successful completion, young scientists will gain the ability for independent research in multidisciplinary teams from many areas of biotechnology and medical sciences.

The program of the proposed doctoral course will develop in line with the existing scientific potential of the faculty, students expressed interest and the need of the employers, with accurately described competencies and skills that doctoral candidates will possess after the end of the course. The content of the courses will be constantly updating and if necessary each will be coordinated in order to avoid overlap with contents of undergraduate courses. Teaching will be based as much as possible on the practical work of students in acquiring the relevant and latest scientific knowledge. From the start of their doctoral course students should join the work of scientific projects and continuously monitor the scientific literature in order to develop their own critical stance toward their own results and ideas. Besides that the students, if necessary will be allowed study visit in the appropriate foreign scientific institutions in order to master the specific techniques and skills.

Innovativeness of the program lies in a completely new approach that allows maximum creativity of the student who in collaboration with the mentor will shape their own study program based on the offered courses. Also this program allows greater freedom and initiative of the student to devote to learning of those contents which will be in tune with the theme of their thesis or, in general, with their scientific interest. As a result, students will be established as top experts in conducting scientific processes in a particular scientific discipline. The involvement of scientists from other scientific institutions in realization of the program will allow development of cooperation in solving the given scientific problems.

2. GENERAL PART

- **Realized by:** University "St. Cyril and Methodius" - Faculty of Veterinary medicine - Skopje

- **Study program:** Doctor of Science (in food safety) third cycle of studies

- **Scientific field:**

Biotechnical sciences

- **Scientific sub-field:**

Veterinary medicine

- **Scientific discipline:**

Hygiene and technology of products and raw materials of animal origin

- **Duration of studies:** three years (6 semesters)

Study program from third cycle studies (doctoral studies) is organized in accordance with the Law on Higher Education, the Rules for doctoral studies, as study program with duration of three years which contains in total 180 credit points (ECTS), and one credit point is equivalent to 30 hours total working engagement.

The total number of credits (180) are acquired in several fields i.e. integral parts of the third cycle (doctoral) studies:

- Training for research = 30 ECTS:
 - Three compulsory courses for gaining generic knowledge = 12 ECTS, and
 - Doctoral seminars, conferences and workshops for research practice = 18 ECTS
- Education consisted of ten courses from the sub-field and area of research = 30 ECTS, and

Registration, preparation and presentation of the doctoral dissertation = 120 ECTS
Teaching of the courses will be carried out in Macedonian and / or English depending on the linguistic homogeneity or heterogeneity of the students. The doctoral thesis will be written in Macedonian and / or English language. Presentation of doctoral thesis will be in public, in Macedonian or English.

The conditions and enrolment at the studies are in accordance with the Law on Higher Education, the Rules for doctoral studies, as well with the detail specific criteria in the Competition, published by the University, "St. Cyril and Methodius" in Skopje prior beginning of every academic year.

The basic requirements for entering the study program of the third cycle:

1. Diploma/Certificate:

- for completed integrated first and second cycle i.e. completed second cycle of studies in Bologna in the field of veterinary medicine, medical sciences, natural sciences and biotechnological sciences, or
- for Master of Science in the old curriculum of the above indicated areas or
- for acquired 300-360 credits from related studies of regulated professions, or

- for title of specialist in adequate specialization
2. Spoken English (Certificate of Faculty of Philology "BlazheKoneski" or an international certificate such as TOEFL, FCE, CAE)¹.

Criteria for ranking the candidates:

- The success gained at the previous integrated cycle i.e. previous two cycles
- Published publications
- Participation in national and international research projects
- Study visit abroad
- Knowledge of other languages
- Interview
- Motivation letter
- Recommendations and other specific criteria

3. STUDY PROGRAM STRUCTURE

The structure of the study program for doctoral studies (the distribution of credits and liabilities of the courses per semester) is shown in Table 1.

Table 1: STRUCTURE OF THE STUDY PROGRAM FOR DOCTORAL STUDIES (the distribution of credits by courses and liabilities by semesters)

<i>I year</i>		
I semester		
15 th September	1. Courses for gaining generic knowledge 2. Courses from subfield and area of research (compulsory)	Maximum (1+2) 30 ECTS
October		
November		
December		
January	Exam session	
II semester		
February	1. Courses for gaining generic knowledge 2. Courses from subfield and area of research (elective)	Maximum (1+2) 12 ECTS
March		

¹If a student obtained the education of the previous two cycles in English as proof of knowledge of English will be considered the diploma for completed second cycle or integrated first and second cycle of studies.

April	Doctoral seminar with presentation	2 ECTS
May	Research (preparation of the theme of the doctoral dissertation)	14 ECTS
15 th May -15 th June	Exam session	
First week of September	Annual conference with presentation of report	2 ECTS
<i>II year</i>		
III semester		
15 th September October November December	Preparation and filing in a topic for the doctoral dissertation and research	28 ECTS
January	Exam session Doctoral seminar with presentation of report	2 ECTS
IV semester		
February	Work shop for research practise	3 ECTS
March April May	Research and publication of the results	25 ECTS
15 th May -15 th June	Exam session	
First week of September	Annual conference with presentation of report	2 ECTS
<i>III year</i>		
V semester		
15 th September October November December January	Research and publication of the results	28 ECTS
January	Doctoral seminar with presentation of report	2 ECTS
VI semester		
February	Work shop for research practise	3 ECTS
March	Research and writing the thesis	25 ECTS

April		
May		
First week of September	Annual conference with presentation of report	2 ECTS

LIST OF COURSES

I). Courses for general generic knowledge organized by the School of Doctoral Studies:

1. Ethics (4 ECTS points)
2. Use of animals in scientific and research purposes (4 ECTS points)
3. Methods of clinical research and verification of laboratory results (4 ECTS points)

II). Courses from the subfield and area of research:

A. COMPULSORY COURSES

Code	Course	Teacher
FVM-BH1	Food chemistry and biochemistry	prof. Velimir Stojkovski, PhD prof. Zehra Hajrula-Musliu, PhD
FVM-BH2	Food microbiology	prof. Pavle Sekulovski, PhD
FVM-BH3	Veterinary drugs residues and contaminants in food	prof. Zehra Hajrula-Musliu, PhD prof. Romel Velev, PhD

B. ELECTIVE COURSES

Code	Course	Teacher
FVM-BH4	Instrumental methods for food analysis	prof. Zehra Hajrula-Musliu, PhD prof. Velimir Stojkovski, PhD
FVM-BH5	Molecular-genetic methods and food poisoning epidemiology	prof. Pavle Sekulovski, PhD prof. Slavcho Mrenoshki, PhD
FVM-BH6	Animal welfare and food quality	prof. Vlatko Ilieski, PhD
FVM-BH7	Herd health and production management on diary farms	prof. Toni Dovenski, PhD prof. Plamen Trojachanec, PhD prof. Dine Mitrov, PhD
FVM-BH8	Basis of veterinary toxicology	prof. Romel Velev, PhD
FVM-BH9	Food safety and veterinary public health	prof. Pavle Sekulovski, PhD
FVM-BH10	National and European food legislative	prof. Risto Prodanov, PhD prof. Pavle Sekulovski, PhD
FVM-BH11	Practical application of molecular methods in detection and epidemiology of pathogenic microorganisms	prof. Slavcho Mrenoshki, PhD

Respective courses, with a brief description of the contents are given in Appendix 1.

4. EXPLANATION FOR REALIZATION OF THE STUDY PROGRAM

FVMS is housed in 5 buildings with a total area of 3660 m², with the administrative part, 3 lecture rooms (50, 40 and 30 seats, respectively), an computer classroom, library and 12 laboratories (Table 2).

The study program will be realized in total at the FVMS by the teachers from the Faculty of Veterinary Medicine at the University "Ss. Cyril and Methodius" in Skopje. They are listed bellow:

Full professors

- prof. Velimir Stojkovski, PhD
- prof. Risto Prodanov, PhD
- prof. Toni Dovenski, PhD
- prof. Vlatko Ilieski, PhD
- prof. Plamen Trojachanec, PhD
- prof. Romel Velelev, PhD

Associated professors

- prof. Dine Mitrov, PhD
- prof. Pavle Sekulovski, PhD
- prof. Zehra Hajrulai-Musliu, PhD
- prof. Slavcho Mrenoshki, PhD

Every academic year, prior publication of Competition for PhD studies, PhD Studies Council at the FVMS adopts list of mentors which is delivered to the University PhD Studies Professional Council for approve. Currently, list of mentors for this study program contains 3 full professors and 3 associated professors. They are listed bellow:

- prof. Velimir Stojkovski, PhD
- prof. Toni Dovenski, PhD
- prof. Vlatko Ilieski, PhD
- prof. Dine Mitrov, PhD
- prof. Pavle Sekulovski, PhD
- prof. Zehra Hajrulai-Musliu, PhD

According the facilities, equipment and size of the teaching staff, the number of PhD student who could be enrolled on this study program in first year is 15.

Basic and additional teaching aids listed bellow in this guide for the courses is obtained by the course teachers and are available for the PhD students.

Information about the study program is available on University's web site <http://www.ukim.edu.mk>, as well as on Faculty's web site <http://www.fvm.ukim.edu.mk/>.

International mobility of the students is realized via WetNest CEEPUS network and Erasmus program. More detailed information about mentioned above could be found on Faculty's web site.

Table 2: STUDY PROGRAMME REALIZATION PLACE, FACILITIES AND EQUIPMENT

Facilities	Equipment
Laboratory for serology and molecular diagnostics (for serological testing)	<ul style="list-style-type: none"> • ELISA readers <ul style="list-style-type: none"> ▪ BDSL Immunoscan PLUS ▪ HumaReader HS • Shaker with incubator <ul style="list-style-type: none"> ▪ Heidolph TITRAMAX 1000/INKUBATOR 1000 • Water baths <ul style="list-style-type: none"> ▪ MEMMERT 350W ▪ P SELECTA • Microtitrationpipettors • Refrigerators for cooling (5 °C), freezing (-24 °C) and deep freezing (-80 °C)
Laboratory for serology and molecular diagnostics (for molecular diagnostics, PCR)	<p>Laminar chambers</p> <ul style="list-style-type: none"> - TERMOVENT - FASTER BH-EN 2003 - TELSTAR <p>Centrifuges</p> <ul style="list-style-type: none"> - MIKRO 120 - EPPENDORF <p>Wortex</p> <ul style="list-style-type: none"> - VWR International - Heidolph <p>Thermocycle reader</p>

	<ul style="list-style-type: none"> - BIO RAD IQ5 RT-PCR - TECHNE TC-412 <p>Systems for gel-electrophoresis (GEF)</p> <ul style="list-style-type: none"> - VWR - BIO RAD PowerPac Basic <p>Ultraviolet (UV) reader</p> <ul style="list-style-type: none"> - VWR GenoView <p>Sequencioner</p> <ul style="list-style-type: none"> - Applied Biosystems ABI PRISM 310 Genetic Analyzer <p>Microtitrationpipettors</p> <p>Refrigerators for cooling (5 °C), freezing (-24 °C) and deep freezing (-80 °C)</p>
<p>Laboratory for bacteriology</p>	<ul style="list-style-type: none"> • Fluorescent microscope -Olympus • Laminar chamber - Telstar • Thermostat - Sutjeska • Refrigerator on -20°C Gorenje • Refrigerator - Frinko • Refrigerator - Celex • Magnet shaker - Technica
<p>Laboratory for virology</p>	<ul style="list-style-type: none"> • Water bath -Sutjeska • Inverse microscope - Kruss • Centrifuge - Eppendorf • Laminar chamber - Thermo • Cell culture incubator - Thermo • Egg incubators (2) -Brinsea • Laminar chamber - Fast

	<ul style="list-style-type: none"> • Centrifuge - Hettich Micro 200 • Inverse microscope with fluorescence - Hund • Centrifuge -Sigma • CO₂incubator - Leec • monochanel and multichannel pipettors • Refrigerator on -80°C -(II Shin)
<p>Laboratory for parasitology</p>	<ul style="list-style-type: none"> • microscope Eclipso 600 Nikon • microscopes Nikon-3 • thermostatSutjeska • centrifuge - Labofuge 200 with fixed rotor • centrifuge Hettich Universal 32 • refrigerator – Gorenje • sterilizator–Instrumentaria, Zagreb • magnet shaker - Technica • Baerman apparatus • Mc master chambers • heating plate Mini-tube
<p>Laboratory for food and feed microbiology</p>	<ul style="list-style-type: none"> • RT-PCR, • PFGE, • Vitek 2, • Colony counter • Autoclaves, • Sterilizators, • Incubators, • Stomacher, • Dilumats,

	<ul style="list-style-type: none"> • Microscopes, • Water baths, • Lyophylozators, • Centrifuges, • Spectrophotometer, • Laminar cabinets, • Water destilators and deionizators, • refrigerators, • freezers, • weighing machines, • laboratory furniture with the appropriate installation, • laboratory inventory with chemicals, • operating supplies and other accessory equipment
Laboratory for residues and contaminants	<ul style="list-style-type: none"> • Gas chromatograph with ECD and FID Hewlett Packard 5890 Series II, • Headspace sampler- Hewlett Packard 649E , • Atomic absorbtion spectrometer with flame photometry AAS Analyst 400 Perkin Elmer, • Atomic absorbtion spectrometer with Graphite furnace AAS Analyst 600 Perkin Elmer, • Balance , • System analysis of mercury, • Spectrophotometer, • Gas chromatograph with mass detector-Varian 3900, • Nitrogen evaporator, • homogeniser, • Ultratureks homogeniser,

	<ul style="list-style-type: none"> • Vacuum pump • Centrifuge, • Blender, • Gas chromatograph with mass detector - Hewlett Packard 5890 Series II, • ELISA Reader , • Water bath • Vortex mixer for test tubes, • Magnetic mixer • pH meter, • ELISA kit, • Laboratory furniture with digesters with the necessary installation for work • Laboratory inventory (glassware) • Chemicals and other auxiliary equipment
<p>Laboratory for quality of food and feed</p>	<ul style="list-style-type: none"> • Digester- Faster • Moisture meters – Sartorius • Oven – Binder GmbH • Sterilizer – Instrumetaria Zagreb • Centrifuge – Funke-Dr.N.Gerber • Water bath – Techne • Heating coating- Hozic Elektromehanika Kranj • Heating coating– Hozic • Electric hot plate – Schott Instruments • Hot plate – Schott Instruments • Sand bath – Inko

	<ul style="list-style-type: none"> • Sand bath – J.P. selecta • Oven for burning – SNOL • Apparatus for incineration of protein – Gerhardt • Analytical balance – Sartorius • Analytical balance – Sartorius • Balance – Tehnica • Hectolitre balance – Kitt Electric Laboratory • Vacuum pump – Sartorius • Apparatus for distillation of protein – PBI • Refractometer • Saharomat-Polaroid - Shmidtt + Haenchs • Spectrofotometer – Perkin Elmer • Saharofleks - Shmidtt+Haenchs • dispenzer – Brand • dispenzer – OPTIFIX • Apparatus for distillation of wine – Gibertini Elettronica SRL • Titrator – Metrohn • refrigerator – Gorenje • pH-meter – Sartorius • freezer • laminar chamber
<p>Laboratory for raw milk quality</p>	<ul style="list-style-type: none"> • FOSS Milkoscan 4000: instrument for chemical analysis of raw milk (fat, protein, lactose, dry matter); • FOSS Fossomatic 5000: instrument for somatic cell counting in raw milk; • FOSS Bactocount IBC: instrument for measuring total bacteria count in raw milk;

	<ul style="list-style-type: none"> • Funke Gerber Cryostar I: instrument for determining the freezing point of raw milk; • DSM Delvo test: test for detecting the presence of inhibitors (antibiotics) in raw milk
Laboratory for radiobiology	<ul style="list-style-type: none"> • High Purity P-Type Coaxial Germanium Detector and Cryostat (GC018-7500SL, S\N b 04029) • Liquid Nitrogen Filling System(D 50,NTD 50) • Top Opening Lead Shielding(IGS4, S/N 4648) • 2 Alpha Detectors (A450-20AM, S/N 57070,57071) • 2 Alpha Spectrometers (7401VR, S/N 06041467, 06041468) • Rotary Vacuum Pump (Trivac D2. 5E, S/N 30000046188) • 0-6 kV High Voltage Power Supply (3106D, S\N 09042823) • Spectroscopy Main Amplifier (2026, S/N 09042746) • 3ADC\MCA (Multiport-II, MP2-3U, S/N 09043055) • NIM BIN /Power Supply (7023, S/N 040823) • Dell Otiplex GX270 Computer (S/N G40K71J) , Monitor (S\N BH68-00563D-02) • Genie-2000 Based Spectroscopy Software (G2K-CPCE10, V3.0) • Germanium detector (GAMMA3) • Detector preamplifier test point voltage at 45000V
Laboratory for pharmacology and toxicology	<ul style="list-style-type: none"> • Routine equipment for handling with experimental animals • Equipment for measuring and registration of vital parameters in experimental animals (blood pressure gas flow, infusion pumps, ECG etc)
Laboratory for biochemistry	<p>Spectrophotometer – Cecil Instruments</p> <p>Centrifuge</p> <p>Water bath – Memmert</p> <p>Water bath from 0-100° C – Lauda RMG</p> <p>PCR Thermo Cycler - Perkin Elmer Cetus</p>
Centre for adverse events and information for	<ul style="list-style-type: none"> • Computer with software for collecting, monitoring, processing and evaluation of adverse effects related with use of veterinary medical prepartes and human medical prepartes during treatment of the

veterinary drugs	animals.
Center for animal welfare	<p>Centrifugation machine Water bath</p> <ul style="list-style-type: none"> • pH meter • Analytical scales • Refrigerator cooling (4°C) • Deep freeze (-22°C) • Chamber of cooling (4°C) • Chamber of deep freeze (-22°C) <p>Laminar chamber</p> <ul style="list-style-type: none"> • Magnetic mixer <p>Termostate Cryotome Microtome Meat slicer Nikon microscope with morphometry software (Lucia G/M)</p> <ul style="list-style-type: none"> • Inventory with laboratory chemicals <p>Supplies and accessories</p>
University veterinary hospital for pet animals and equines	<ul style="list-style-type: none"> • Apparatus for inhalation anesthesia of small animals with components and spare parts Matrix, • Ventilator Surgivet, • Thermocauter Koagol 150, • Monitor for vital functions ECG, pulsoxymeter, capnograph with respiratory and non invasive venous pressure Mindray, MEC 1200 Vet, • Perfusor JorVet, J-1060, • Infusion pump JorVet, J-1047, • Ultrasonic apparatus for cleaning teeth Bonart medical, ART-M1, • Negatoscope JorVet, J-1022, • Ultrasound Mindray, DP-6600 Vet, • Surgical light Dr. Mach, • Surgical table Krusse, • Tables for physical examination Krusse, • Lamb for clinical examination JorVet, • Otoscope with ophthalmoscope Krusse, • Apparatus for measuring specific weight of urine Krusse,

	<ul style="list-style-type: none"> • Electronic scales Krusse, • Sterilizer Sutjeska, • Stand for medicines and instruments Krusse, • Table on wheels for patients JorVet • Stand for infusions Krusse • Surgical set for standard surgical interventions Krusse • Cages for intensive care • ECG apparatus CARDIOLINE ar 600adv
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Table 3: Teaching staff on the study program

No.	SECOND NAME	NAME	RANGE	COURSE OF THE PhD STUDIES	eMail
01	Stojkovski	Velimir	PhD - professor	<ul style="list-style-type: none"> • Food chemistry and biochemistry • Instrumental methods for food analysis 	vstojkovski@fvm.ukim.edu.mk
02	Harulai-Musliu	Zehra	PhD- professor	<ul style="list-style-type: none"> • Food chemistry and biochemistry • Veterinary drug residues and contaminants in food • Instrumental methods for food analysis 	zhajrulai@fvm.ukim.edu.mk
03	Sekulovski	Pavle	PhD- professor	<ul style="list-style-type: none"> • Food microbiology • Food safety and veterinary public health • Molecular-genetic methods and food poisoning epidemiology 	pavles@fvm.ukim.edu.mk
04	Velev	Romel	PhD- professor	<ul style="list-style-type: none"> • Veterinary drug residues and contaminants in food • Basis of veterinary toxicology 	vromel@fvm.ukim.edu.mk
05	Ilieski	Vlatko	PhD - professor	<ul style="list-style-type: none"> • Animal welfare and 	vllieski@fvm.ukim.edu.mk

				food quality	
06	Prodanov	Risto	PhD - professor	<ul style="list-style-type: none"> National and European legislative food 	rprodanov@fvm.ukim.edu.mk
07	Dovenski	Toni	PhD - professor	<ul style="list-style-type: none"> Herd health and production management in dairy farms 	dovenski@fvm.ukim.edu.mk
08	Trojachanec	Plamen	PhD - professor	<ul style="list-style-type: none"> Herd health and production management in dairy farms 	plament@fvm.ukim.edu.mk
09	Mitrov	Dine	PhD- professor	<ul style="list-style-type: none"> Herd health and production management in dairy farms 	mitrov@fvm.ukim.edu.mk
10	Mrenoshki	Slavcho	PhD- professor	<ul style="list-style-type: none"> Molecular-genetic methods and food poisoning epidemiology Practical application of molecular methods in detection and epidemiology of pathogenic microorganisms 	mrenoski@fvm.ukim.edu.mk

ANNEX 1

A. VIEW OF THE COMPULSORY COURSES OF THE STUDY PROGRAMME OF PhD STUDIES OF VETERINARY MEDICINE - MODULE: FOOD SAFETY

Course	Use of animals for science research purpose	4.0 ECTS
Code	this is course for general generic knowledge organized by the University School of Doctoral Studies	
Year of study	I	
Semester	winter	
Total teaching lessons	120	
Realized by	prof. Vlatkollieski, PhD	
Purpose and objectives of the course program	This course elaborates the 3-R concept for protection of animals during their use in science research purposes, and practical examples for complete implementation of the 3-R concept. The 3-R concept is crucial for improvement of science and for animal welfare, and is important for ethical and legal reasons, as a fundamental principle of human experimental procedure. This course gives definition of 3-R and obtains guides and directions for using these principles in practice.	
Contents of the course program	<p>Theory classes. 3-R concept: Replacement – using of methods with avoiding or replacing the use of animals in cases when is it possible; Reduction – minimisation of number of animals used in experiment – for example with improvement of the experimental design and statistical analysis used in the research; Modification, alternative (refinement) – improvement of the experimental procedures and other factors with impact on animals, as accommodation and care for decreasing their suffering, torturing and improvement of welfare during rest of their lives.</p> <p>Practicals. Within this course the <i>Council Directive 86/609/EEC of 24 November 1986 on the approximation of laws, regulations and administrative provisions of the Member States regarding the protection of animals used for experimental and other scientific purposes</i> is elaborated. This directive includes the principles of ethical evaluation of the projects; approving of projects, promotion of alternative views in science research work; accommodation and use of animals in science research work; classification of cruelty towards animals, their reusing and their accommodation and nursing. According the Animal Welfare Law this directive implementation of this directive is legal obligation within process of design and realization of the science researching. Teaching includes also information for directions for nursing and accommodation of laboratory animals, including the minimal conditions for accommodation of different animal species, and euthanasia procedures regulated by the Animal Welfare Law.</p> <p>Course also includes explanation of principles of design of science researching project, its justification from aspect of evaluation of injury (of animals) and the benefit of the project, demonstration of manual for obtaining licence for use of animals in different science researching or testings, as well as the work of the ethic committees.</p>	
Organization	60 hours theory classes and practicals 60 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written essay: learning with use of referent literature and internet, making of written essay; oral presentation and discussion of the written essay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	60.0
	Written essay – project with oral presentation	30.0
	Attendance and activity	10.0
Total:	100.0	
Evaluation of knowledge	Periodical evaluations: two (written)	
	Final grade mark forming criteria:	
	Points	Grade mark
	to 59	5 (F)
60-68	6 (E)	

		69-76	7 (D)	
		77-84	8 (C)	
		85-92	9 (B)	
		93-100	10 (A)	
Basic teaching aids	<p>1. д-р Влатко Илиески м-р Лазо Пендовски Хумана еутаназија на животните;</p> <p>2. Hammond-Seaman, A; Ilieski, V; Pendovski, L; and Thomas G (eds) (2008) "The 3Rs Concept The legal Framework on the Protection of Animals"; Proceedings of the Workshop", 28 March 2008, SS Cyril & Methodius University Congress Center, Ohrid Republic of Macedonia</p> <p>3. Vlatko Ilieski, Plamen Trojancane, Lazo Pendovski, Ksenija Ilievska, Endoscopy and bronchoscopy of dog plastinated specimen Educational CD</p> <p>4. Project Western Balkan veterinary network for Animal welfare www.WBVN.net</p>			

Course	Food chemistry and biochemistry	6.0 ECTS
Code	FVM-BH1	
Year of study	I	
Semester	winter	
Total teaching lessons	150	
Realized by	prof. VelimirStojkovski, PhD prof. ZehraHajrula-Musliu, PhD	
Purpose and objectives of the course program	PhD students would extend their knowledge for the structure, content, function and nutritive characteristics of macronutrients present in food, their role and changes during preparation and storing of food.	
Contents of the course program	<p>Theory classes. Features of water as dominant compound in food, especially from aspect on interactions with other present compounds and food stability. From healthaspect this course elaborates impact of nutrition related with macronutrients and water, knowing the needs of vitamins, minerals and antioxidants in humans, with special attention on biochemistry, physiology, metabolism, nutrition resources and micronutrient needs in different phases in man's life. Causes and consequences of macro- and micronutritive deficiencies. The role of micronutrients in disease prevention. Extending of knowledge about additives used in food production and their impact on consumer's health and food quality.</p> <p>In practicals PhD students would have opportunity for individual participation in realization of analyses for determination of food and feed quality. Practicals include: detection of fats in food products with Soxlet method, analysis of fatty acids with gas chromatography, determination of total proteins with Kjeldahl's method, identification and determination of amino acids, detection of mono- and oligosaccharides, detection of antioxidants, artificial sweeteners. Quality and safety of drinking water and their importance for health - detection of: pH, residual hydrogen, chlorides, reduction power, nitrogen compounds (ammonia, nitrites, nitrates) in water, and determination of water alkalinity and hardness.</p>	
Organization	100hours theory classes and practicals 50 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written assay: learning with use of referent literature and internet, making of written assay; oral presentation and discussion of the written assay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	60.0
	Written assay – project with oral presentation	30.0
	Attendance and activity	10.0
Total:	100.0	
Evaluation of knowledge	Periodical evaluations: two(written)	
	Final grade mark forming criteria:	
	Points	Grade mark
	to 59	5 (F)
	60-68	6 (E)
	69-76	7 (D)
	77-84	8 (C)
85-92	9 (B)	
93-100	10 (A)	
Basic teaching aids	1. H.D. Belitz, W. Grosch, P. Schieberle: Food Chemistry, Springer, 2004 2.T.P. Coultate: Food: The chemistry of its Components 5-th edition, Royal society of Chemistry, 2008	
Additional teaching aids	1. Y. H. Hui, Paul Cornillon, Isabel Guerrero Legarreta, Miang H. Lim, K. D. Murrell, Wai-Kit Nip: Handbook of frozen food, Marcel Dekker, Inc. All Rights Reserved. Neither this, 2004 2. Ramesh C. Chandan, Arun Kilara and Nagendra P. Shah: Dairy processing & Quality assurance , Wiley – Blackwell, a Jonh W. Ley, Ltd. publication, 2008	

	3. Annabel L. Merrill, Bernice K. Watt: Energy value of foods, United States Department of Agriculture, 1973
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Course	Food microbiology	6.0 ECTS
Code	FVM-BH2	
Year of study	I	
Semester	winter	
Total teaching lessons	150	
Realized by	prof. PavleSekulovski, PhD	
Purpose and objectives of the course program	<p>The purpose of the course is that the students are gained with thorough theoretical and practical knowledge of food microbiology. The lectures include a review of the fundamentals of food microbiology, the metabolism of the microorganisms, the mechanisms of their growth, reproduction and extinction and the factors which influence them.</p> <p>Students will be acquainted in details with the types of microorganisms and their characteristics and the hazards they pose to the human health.</p> <p>In the practical classes students will be introduced with the routine and advanced methods for the detection of the microorganisms as well with the rapid and automatic methods in food microbiology.</p>	
Contents of the course program	<p>Theory classes. Fundamentals of ecology and epidemiology. Microorganisms present in the stream of food chain. Microbiology of food, feed and drinking water. Control of the microorganisms present on the working surfaces and in environment in object aimed for food production, processing and trading. Ubiquitary microorganisms in food, their useful role and application in process of preservation and modification of food of animal or plant origin. Techniques of microbiological testings, microorganism identification, sampling procedures. Food poisoning: alimentary infections and intoxications, microorganisms which cause diseases and their resources, distribution along the food chain, and their control.</p> <p>Practicals. Procedures of taking, packing, transport and primary processing of food, feed and water samples, swabs. Microbiological analyzing in laboratory according the ISO standards and interpretation of gain results. The PhD student would be trained for identification of isolated microorganism and for testing of antimicrobial resistance.</p>	
Organization	100hours theory classes and practicals 50 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written essay: learning with use of referent literature and internet, making of written essay; oral presentation and discussion of the written essay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	60.0
	Written essay – project with oral presentation	30.0
	Attendance and activity	10.0
Total:	100.0	
Evaluation of knowledge	Periodical evaluations: two(written)	
	Final grade mark forming criteria:	
	Points	Grade mark
	to 59	5 (F)
	60-68	6 (E)
	69-76	7 (D)
	77-84	8 (C)
85-92	9 (B)	
93-100	10 (A)	
Basic teaching aids	<ol style="list-style-type: none"> 1. ICMSF: Microorganisms in Foods, 6th Ed. Microbial ecology of food commodities, Kluwer Academic/Plenum publishers, 2010 2. John Garbutt: Essentials of Food Microbiology, Arnold, 1997 3. Lund, Baird-Parker,Gould: The Microbiological Safety and Quality of Food, Aspen, 2000 	

***Additional
teaching aids***

1. Mossel, Corry, Struijk, Baird: Essentials of the Microbiology of Foods: A Textbook of advanced studies, John Wiley & Sons, 1995
2. ICMSF: Microorganisms in Foods 6th Ed. Characteristics of Microbial Pathogens, Blackie Academic, 1996
3. Doyle and Beuchat: Food Microbiology : Fundamentals and Frontiers 3rd Ed., ASM Press, 2007

Course	Veterinary drugs residues and contaminants in food	6.0 ECTS
Code	FVM-BH3	
Year of study	I	
Semester	winter	
Total teaching lessons	150	
Realized by	prof. ZehraHajrula-Musliu, PhD prof. RomelVelev, PhD	
Purpose and objectives of the course program	The aim of this course is obtaining knowledge for importance and types of additives which are used in food industry, their specificity based on physical-chemical effect as well as safety during use of additives via main national and international legislatives.	
Contents of the course program	<p>Theory classes. Anthropogenic and natural contaminants in food products. Resources and trajectories of entering. Taxonomy of toxicants. Most important contaminants in food. Residues of pesticides, fungicides, herbicides, polychlorated phenols, benzene, aromatic carbohydrogens, polycyclic aromatic carbohydrogens, mycotoxins, inorganic contaminants with high toxicity (arsenic, mercury, cadmium and lead). Chemical effect and features. Importance of pesticide residues, because of their big impact on human's health (MDK, ADI, PTWI). Natural and artificial radionuclides, their distribution along the food chain, contamination of animal products, monitoring. Risk, risk evaluation and risk management. Legislative in our country and in EU.</p> <p>In practicals PhD students would take active participation in laboratory analysis for detection of some residues and contaminants in food (analysis of veterinary drugs in food, analysis of pesticides in food, analysis of mycotoxins in food, analysis of heavy metals in food, analysis of beta-agonists in food, analysis of thyrostatics and stilbens in food, analysis of steroids and resorcine acid lactones etc.)</p>	
Organization	100hours theory classes and practicals 50 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written essay: learning with use of referent literature and internet, making of written essay; oral presentation and discussion of the written essay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	60.0
	Written essay – project with oral presentation	30.0
	Attendance and activity	10.0
Total:	100.0	
Evaluation of knowledge	Periodical evaluations: two(written)	
	Final grade mark forming criteria:	
	Points	Grade mark
	to 59	5 (F)
	60-68	6 (E)
	69-76	7 (D)
	77-84	8 (C)
85-92	9 (B)	
93-100	10 (A)	
Basic teaching aids	<ol style="list-style-type: none"> Yolanda Picó: Food contaminants and residue analysis, Elsevier, 2008 S. N. Mahindru: Food Contaminants-origin,propagation & Analysis, APH Publishing, 2009 Darsa Purnama Siantar, Mary W Trucksess, Peter M Scott: Food contaminants: mycotoxins and food allergens, American Chemical Society, 2008 	
Additional teaching aids	<ol style="list-style-type: none"> Dimitrios J. Fletouris: Drug Residues in Foods: Pharmacology, Food Safety and Analysis (Food Science and Technology), CRC Press; 1st edition, December 15, 2000 	

	2. N.T. Crosby: Determination of Veterinary Residues in Food, Wood head Publishing, 1991
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B. VIEW OF THE ELECTIVE COURSES OF THE STUDY PROGRAMME OF PhD STUDIES OF VETERINARY MEDICINE - MODULE: FOOD SAFETY

Course	Instrumental methods for food analysis	3.0 ECTS
Code	FVM-BH4	
Year of study	I	
Semester	summer	
Total teaching lessons	150	
Realized by	prof. ZehraHajrula-Musliu, PhD prof. VelimirStojkovski, PhD	
Purpose and objectives of the course program	The aim of this course is understanding the principles and procedures in food products analytics.	
Contents of the course program	<p>Theory classes. Methodology included in this course would depend on component which is subject of analysis, the product's type, the purpose of the analysis and available equipment. Metter of observation would be the most important analytical techniques as gas and liquid chromatography, spectroscopy, electrophoresis and ELISA for detection of residues and contaminants in food, protein and fatty acid profile, vitamins and minerals, specific additives and testings for presence of other microcompounds in products with toxicological significance.</p> <p>Within practicals the PhD students would take active participation in analyses made for detection of food safety, and they would have opportunity to be introduced with analytical methods for food safety monitoring, their practical implementation, problems appearing during performance of testings, and their verification and validation.</p>	
Organization	100 hours theory classes and practicals 50 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written essay: learning with use of referent literature and internet, making of written essay; oral presentation and discussion of the written essay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	60.0
	Written essay – project with oral presentation	30.0
	Attendance and activity	10.0
Total:	100.0	
Evaluation of knowledge	Periodical evaluations: two(written)	
	Final grade mark forming criteria:	
	Points	Grade mark
	to 59	5 (F)
	60-68	6 (E)
	69-76	7 (D)
	77-84	8 (C)
	85-92	9 (B)
93-100	10 (A)	
Basic teaching aids	<ol style="list-style-type: none"> S. Harisha, Ph.D.: Biotechnology procedures and experiments handbook , David F. Pallai, INFINITY SCIENCE PRESS LLC, Hingham, Massachusetts, New Delhi, India, 2007 John R. Crowther: The ELISA Guidebook, School of Life Sciences, University of Hertfordshire, Hatfield, Hertfordshire, AL10 9AB, UK, 2009 Svjetlana Luterotti: Uvod u kemisku analizu, Farmaceutsko-biokemijski fakultet Sveučilišta u Zagrebu, 2009 	
Additional teaching aids	Jack F. Kay: Analyses for Hormonal Substances in Food-producing Animals, The Royal Society of Chemistry, 2010	

Course	Molecular-genetic methods and food poisoning epidemiology	3.0 ECTS
Code	FVM-BH5	
Year of study	I	
Semester	summer	
Total teaching lessons	150	
Realized by	prof. PavleSekulovski, PhD prof. SlavchoMrenoshki, PhD	
Purpose and objectives of the course program	The aim of course is to introduce the PhD students with most recent techniques of molecular diagnostics and genetical examination used in identification and genetical typisation of microorganisms which are potential foodborne intoxication agents. Typisation of bacterial isolates: phenotypic techniques (serotyping, phagotyping, antimicrobial resistance) and genotypic techniques (gel-electrophoresis, sequencing based techniques). Introduction with different techniques for molecular typisation as: ribotyping, multilocus enzymatic electrophoresis, RAPD (Random Amplification of Polymorphic DNA), PFGE (Pulsed Field Gel Electrophoresis), PCR technique. Basis of foodborne poisoning epidemiology. Taxonomy of foodborne poisonings. Types of analytical studies: group study and control case study. Foodborne infections. Foodborne intoxications. Zoonotic agents. Food transmissible viral diseases. Protozoan infestations.	
Contents of the course program	<p>Theory classes. This course would obtain knowledge and skills about working methodology with equipment for molecular typisation of pathogens with alimentary origin. Detection of genetic relation of isolates with different origin and ways and trajectories of contamination of food production and processing objects. Epidemiological examination methods for foodborne poisonings: control study and cohort study.</p> <p>Practicals. Introducing the protocols for isolate preparation for Pulse-field gel electroforesis, usage of different restrictive endonucleases, programming of CHEF Mapper XA module for different electrophoresis protocols, electronic registration of gel, and forming of clusters with application of FPQuest software. Also, the PhD students would work on comparison of gained results with existing database for PFGE and implementation of epidemiological traceability for detection of decontamination resource. Students would also have possibility to be introduced with working protocols for real time PCR, extraction, amplification during qualitative and quantitative testings, analysis of different genetical sequences during testing of pathogenic microorganisms, detection of allergens and genetic modified organisms in food, and origin of proteins in products with animal origin.</p>	
Organization	100hours theory classes and practicals 50 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written essay: learning with use of referent literature and internet, making of written essay; oral presentation and discussion of the written essay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	60.0
	Written essay – project with oral presentation	30.0
	Attendance and activity	10.0
Total:	100.0	
Evaluation of knowledge	Periodical evaluations: two(written)	
	Final grade mark forming criteria:	
	Points	Grade mark
	to 59	5 (F)
	60-68	6 (E)
69-76	7 (D)	
77-84	8 (C)	

		85-92	9 (B)
		93-100	10 (A)
<i>Basic teaching aids</i>	<ol style="list-style-type: none"> 1. Eley: Microbial Food Poisoning, Chapman & Hall, 1996 2. ICMSF: Microorganisms in Foods 6th Ed. Characteristics of Microbial Pathogens, Blackie Academic, 1996 3. Lund, Baird-Parker, Gould: The Microbiological Safety and Quality of Food, Aspen, 2000 		

Course	Animal welfare and food quality	3.0 ECTS
Code	FVM-BH6	
Year of study	I	
Semester	summer	
Total teaching lessons	150	
Realized by	prof. Vlatkolieski, PhD	
Purpose and objectives of the course program	The course of Animal welfare and food quality provides competences for animal welfare operational knowledge during transport, animal handling in the lairage, slaughtering process, as well as implementation of molecular methods for monitoring and quality of meat and meat products.	
Contents of the course program	<p>Theory classes. The Animal welfare and food quality course is focusing on the general principles and definitions of animal welfare. It elaborates the animal welfare standards and their assessment in the production chain “from field to the fork”, animals production parameters in relation with animal welfare, the relationship between the quality of animal products and animal welfare on the farm and animal welfare during slaughter.</p> <p>Practicals. Students will be introduced with the sampling methods for histo-enzyme and immunohistochemical methods. The examinations involve modern molecular methods and genetic research (RT-PCR) used for identification of the type and origin of meat considering the animal species and its identification in the meat products.</p>	
Organization	100hours theory classes and practicals 50 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written essay: learning with use of referent literature and internet, making of written essay; oral presentation and discussion of the written essay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	60.0
	Written essay – project with oral presentation	30.0
	Attendance and activity	10.0
Total:	100.0	
Evaluation of knowledge	Periodical evaluations: two(written)	
	Final grade mark forming criteria:	
	Points	Grade mark
	to 59	5 (F)
	60-68	6 (E)
	69-76	7 (D)
	77-84	8 (C)
	85-92	9 (B)
93-100	10 (A)	
Basic teaching aids	<ol style="list-style-type: none"> 1. Темпл Грандин: Подобрување на благосостојбата на животните, CAB International, 2010 2. Д.М. Брум, К.Џ. Џонсон: Стресот и благосостојбата на животните, Клувер академски издавачи, 1993 	

Course	Herd health and production management on diary farms	3.0 ECTS
Code	FVM-BH7	
Year of study	I	
Semester	summer	
Total teaching lessons	150	
Realized by	prof. Toni Dovenski, PhD prof. Plamen Trojachanec, PhD prof. Dine Mitrov, PhD	
Purpose and objectives of the course program	The aim of the course is to introduce PhD students with: principles of formulation of goals and systemic strategies, making records, organization of farm visits according predicated protocol; to become familiar with epidemiological and economical aspects of HHM; introducing with monitoring principles and managing of dry period, milk production and metabolical diseases, reproductive performances, udder health, hoof health; monitoring of infectious diseases, management of reproduction, milk production and herd refreshing.	
Contents of the course program	<p>Theory classes.</p> <ul style="list-style-type: none"> • Basic principles, objectives and systematic strategies for herd health management of farm animals for milk and meat production (farm visit protocol, making records, epidemiological and economical aspects of HHM) • Monitoring of herd refreshing: offspring management, definition and realization of protocol and pre-directed objectives • Optimization of milk production: principles and methods for optimization of digestion in preventricles, management of metabolical diseases related with rumen. Definition of pre-directed objectives, their realization and monitoring • Monitoring of dry period management: strategy before and during drying and in dry period; physiological changes, diseases and prevention in dry period <p>Practicals.</p> <ul style="list-style-type: none"> • Udder health management: definition of main and pre-directed objectives, pathobiology, epidemiology and infection models. Realization of protocol, making decisions, analysis, treatment and monitoring • Monitoring on reproductive performances: definition of objectives for optimization of reproductive performances, reproductional parameters, realization, making decisions and monitoring • Hoof health monitoring: making main and pre-directed objectives, realization of monitoring protocol. Realization, making decisions, analysis, treatment and monitoring. <p>Control of infectious diseases: monitoring and control of important infectious diseases: BVDV, IBR/IPV, BRSV, PRRS, leptospyrosis, paratuberculosis, salmonellosis, brucellosis, leucosis, contagious ectima.</p>	
Organization	100hours theory classes and practicals 50 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written essay: learning with use of referent literature and internet, making of written essay; oral presentation and discussion of the written essay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	60.0
	Written essay – project with oral presentation	30.0
	Attendance and activity	10.0
Total:	100.0	

Evaluation of knowledge	<p>Periodical evaluations: two(written) Final grade mark forming criteria:</p> <table border="1"> <thead> <tr> <th>Points</th> <th>Grade mark</th> </tr> </thead> <tbody> <tr> <td>to 59</td> <td>5 (F)</td> </tr> <tr> <td>60-68</td> <td>6 (E)</td> </tr> <tr> <td>69-76</td> <td>7 (D)</td> </tr> <tr> <td>77-84</td> <td>8 (C)</td> </tr> <tr> <td>85-92</td> <td>9 (B)</td> </tr> <tr> <td>93-100</td> <td>10 (A)</td> </tr> </tbody> </table>	Points	Grade mark	to 59	5 (F)	60-68	6 (E)	69-76	7 (D)	77-84	8 (C)	85-92	9 (B)	93-100	10 (A)
Points	Grade mark														
to 59	5 (F)														
60-68	6 (E)														
69-76	7 (D)														
77-84	8 (C)														
85-92	9 (B)														
93-100	10 (A)														
Basic teaching aids	<ol style="list-style-type: none"> 1. Brand A., J.P.T.M. Noordhuizen, Y.H, Schukken: Herd Health and Production management in dairy practice, Wageningen Pres, The Netherlands, 1997 2. Radostits O.M., Leslie K.E., Fetrow J.: Herd Health - Food Animal Production Medicine , 2. edition, W.B. Saunders Company, 2001 3. Blood, D. C.; Radostits, O. M.: Herd Health Management, W.B. SaundersCompany, 1985 														
Additional teaching aids	<ol style="list-style-type: none"> 1. DovenskiT. et al.: Menadžmentzdravljestadaiproizvodnjeufarmskomuzgojumlečnihgoveda , 6. "Clinicaveterinaria" Zbornik, 204-210, 2004 2. Josef G. Regli, DVM: Herd health management and record keeping for dairy sheep, http://www.ansci.wisc.edu/ 3. USDA Sustainable Research and Education (SARE) Program: Managing for Herd Health in Alternative Swine Systems: A Guide, http://www.pfi.iastate.edu/pigs.htm, 2007 														

Course	Basis of veterinary toxicology	3.0 ECTS
Code	FVM-BH8	
Year of study	I	
Semester	summer	
Total teaching lessons	150	
Realized by	prof. RomelVelev, PhD	
Purpose and objectives of the course program	The goal of this course is to introduce the student with the main principles of veterinary toxicology: structure, mode of action and pharmacokinetics of toxic substances, pathogenesis, clinical diagnosis and treatment of poisoned animals, ethical, environmental implications and implications on human health from potential use of toxic substances; evaluation of products of animal origin contaminated with toxins etc.	
Contents of the course program	<p>Theory classes. Definition, range and subject of study of toxicology. Main terms in toxicology. Taxonomy of poisons. Toxokinetics and toxodynamic of poisons. Factors with impact on poisons. Ecological evaluation of poisons.</p> <p>Practicals. Basis of poisoning in particular animal species, diagnostics and therapy of poisoned animals. Veterinary-sanitarian expertise of products of animal origin in animal poisoning.</p>	
Organization	100hours theory classes and practicals 50 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written essay: learning with use of referent literature and internet, making of written essay; oral presentation and discussion of the written essay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	70.0
	Written essay – project with oral presentation	20.0
	Attendance and activity	10.0
Total:	100.0	
Evaluation of knowledge	Periodical evaluations: two(written)	
	Final grade mark forming criteria:	
	Points	Grade mark
	to 59	5 (F)
	60-68	6 (E)
	69-76	7 (D)
	77-84	8 (C)
85-92	9 (B)	
93-100	10 (A)	
Basic teaching aids	<ol style="list-style-type: none"> 1. Dilov, P., Georgiev, B., Borissova, L., Stoyanov, K., Vrbcheva, V., Lazarova, S., Kostadinov, J., Kirov, K., Alexandrov, M., Angelov: Veterinary medical toxicology, SD "Lotus" Sofia, 2005 2. Vjekoslav Srebočan: Veterinarska toksikologija, Medicinska naklada, Zagreb, 1993 3. Vjekoslav Srebočan: <i>Otrovanja</i>.in: Srebočan, V. i Gomerčić, H.: Veterinarski priručnik. 4 izdanje, JUMENA, Zagreb, 1989 	
Additional teaching aids	Jordan Nikolov, Rumen Binev: Klinicka veterinaro medicinska toksikologija, "Kontrast" Stara Zagora, 2008	

Course	Food safety and veterinary public health	3.0 ECTS
Code	FVM-BH9	
Year of study	I	
Semester	summer	
Total teaching lessons	150	
Realized by	prof. PavleSekulovski, PhD	
Purpose and objectives of the course program	The aim of the course is to introduce the PhD students with veterinary public health as a part of responsibilities and range of activities of veterinary medicine, animal and human health, and environment control. Also, the role and tasks of the official veterinarian in control of diseases with report obligation would be elaborated. Students would be introduced with slaughterhouse animals hygiene, processing of food of animal and plant origin, distribution and manipulation and their impact on food safety. This course includes also longitudinal and integral approach to production of safe food in aspect of animal welfare, processing hygiene and impact of food on human's health.	
Contents of the course program	<p>Theory classes. Objects for production and processing of food of animal and plant origin, necessary technical and technological requirements, construction, design and prerequisites for introducing of GHP, GMP, SSOP programs and implementation of HACCP and ISO. Premortal inspection and conditions required for slaughterhouse. Control and prevention of presence of parasites, antibiotics, hormones. Slaughterhouse monitoring and control of some infectious diseases on slaughterhouse line and taking and delivering samples for laboratory testing. Solving problems related with fulfillment of legal requirements on animal welfare in slaughterhouse. Sampling procedures for implementation of national monitoring program for <i>Salmonella</i>, residues and contaminants in food. Procedures and treatment of by-products from slaughterhouse and food industry. Professional diseases.</p> <p>Practicals. Practical work in objects for food production and processing (slaughterhouse, dairy, meat industry). Inspection monitoring for implementation of GHP, GMP, SSOP programs and implementation of HACCP and ISO. Monitoring of slaughterhouse and sampling for various national monitoring programs. Monitoring methods for fulfilling animal welfare in slaughterhouse)</p>	
Organization	100 hours theory classes and practicals 50 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written essay: learning with use of referent literature and internet, making of written essay; oral presentation and discussion of the written essay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	60.0
	Written essay – project with oral presentation	30.0
	Attendance and activity	10.0
Total:	100.0	
Evaluation of knowledge	Periodical evaluations: two(written)	
	Final grade mark forming criteria:	
	Points	Grade mark
	to 59	5 (F)
	60-68	6 (E)
	69-76	7 (D)
	77-84	8 (C)
85-92	9 (B)	
93-100	10 (A)	
Basic teaching aids	<ol style="list-style-type: none"> 1. Buncic: Integrated Food Safety and Veterinary Public Health, CABI International, 2006 2. Food Safety risk analysis, FAO and WHO, 2006 3. Schmidt and Rodrick: Food Safety Handbook, Wiley, 2003 	

Course	National and European food legislative	3.0 ECTS
Code	FVM-BH10	
Year of study	I	
Semester	summer	
Total teaching lessons	150	
Realized by	prof. Risto Prodanov, PhD prof. Pavle Sekulovski, PhD	
Purpose and objectives of the course program	This course introduces the PhD students with the national and European legislative which is applied for safe and high-quality food and feed.	
Contents of the course program	<p>Theory classes. General principles of European legislation related with food. EFSA. FVO. White book. Food Safety Law. Hygiene package, microbial criteria for food. Obligate national monitoring programs. Monitoring of residues and contaminants in food with animal origin. Monitoring of zoonoses and zoonotic agents. Monitoring of Salmonella. National legal acts related with food. Bylaws (rules).</p> <p>Practicals. Making records, decisions, reports.</p>	
Organization	100 hours theory classes and practicals 50 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written essay: learning with use of referent literature and internet, making of written essay; oral presentation and discussion of the written essay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	60.0
	Written essay – project with oral presentation	30.0
	Attendance and activity	10.0
Total:	100.0	
Evaluation of knowledge	Periodical evaluations: two (written)	
	Final grade mark forming criteria:	
	Points	Grade mark
	to 59	5 (F)
	60-68	6 (E)
	69-76	7 (D)
	77-84	8 (C)
85-92	9 (B)	
93-100	10 (A)	
Basic teaching aids	All legal acts and regulations related with food legislative	
Additional teaching aids	Прирачник за законските прописи од областа на хигиената на храната од животинско потекло, Управа за ветеринарство на РМ, 2009	

Course	Practical application of molecular methods in detection and epidemiology of pathogenic microorganisms	3.0 ECTS
Code	FVM-BH11	
Year of study	I	
Semester	summer	
Total teaching lessons	150	
Realized by	prof. Slavcho Mrenoshki, PhD	
Purpose and objectives of the course program	This course obtains theoretical knowledge and practical skills for understanding and application of molecular methods in detection of pathogens i.e. in diagnostics of diseases in general, with special attention on s.c. foodborne diseases/pathogens.	
Contents of the course program	<p>Theory classes include basis of microorganisms genetics and theoretical introducing the basic molecular techniques, as preparation of PhD students for laboratory practicals.</p> <p>Laboratory practicals would be realized in the Laboratory for molecular diagnostics where the PhD students would work on practical application of molecular techniques which are routine practice in this laboratory (conventional PCR, real time PCR and sequencing). After these activities a discussion with PhD student follows, about the practical application of gained skills in detection of pathogens and epidemiology of disease caused by them.</p>	
Organization	10 hours theory classes and practicals 50 hours other forms of activity	
Teaching methods	Theory classes and practicals: interactive Written assay: learning with use of referent literature and internet, making of written assay; oral presentation and discussion of the written assay.	
Specific recommendations related with teaching	Scoring of the student's activities:	
	Activity type	Points
	2 periodical evaluations during the teaching or written exam with duration of 2 hours	60.0
	Written assay – project with oral presentation	30.0
	Attendance and activity	10.0
Total:	100.0	
Evaluation of knowledge	Periodical evaluations: two (written)	
	Final grade mark forming criteria:	
	Points	Grade mark
	to 59	5 (F)
	60-68	6 (E)
	69-76	7 (D)
	77-84	8 (C)
85-92	9 (B)	
93-100	10 (A)	
Basic teaching aids	<ol style="list-style-type: none"> 1. Viljoen, Gerrit J.; Nel, Louis H.; Crowther, John R. (Eds.): Molecular Diagnostic PCR Handbook. Springer 2005 2. Sachse, Konrad; Frey, Joachim. (Eds.): PCR Detection of Microbial Pathogens. Humana Press, 2003 3. Pelt-Verkuil, Elizabeth van; Belkum, Alex van; Hays, John P.: Principles and Technical Aspects of PCR Amplification. Springer, 2008 	
Additional teaching aids	<ol style="list-style-type: none"> 1. Bartlett, John M.S.; Stirling, David. (Eds.): PCR Protocols. Humana Press, 2003 2. M. Tefik Dorak (Ed.): Real-time PCR. Taylor & Francis Group, 2007 	