University "Ss. Cyril and Methodius" - Skopje

FACULTY OF VETERINARY MEDICINE - SKOPJE

STUDY GUIDE

Informations about the study program and enrolling propositions for students enrolled since academic year 2009/2010

Skopje, 2010

CONTENTS

FIRST PART: GENERAL INFORMATION

I

HISTORY OF THE FACULTY OF VETERINARY MEDICINE - SKOPJE

1. History

Veterinary Faculty in Skopje is founded in academic year 1991/1992, as a department of Agriculture Faculty in Skopje, with Decision of Ministry for Education and Sport from 1.11.1991. According thi Decision, the Agriculture Faculty was compulsoryd to start with teaching on 6.11.1991 with study on first and second year, with students returned from the other veterinary faculties from the former SFR Yugoslavia.

On 30.01.1993, the Education-science Council of the Agriculture Faculty in Skopje adopted decision for separation of the veterinary department in particular Veterinary Faculty.

After making contracts between Veterinary Faculty, Veterinary Institute, Main Veterinary Hospital and Agriculture Faculty for obtaining premises and equipment which would be used for doing study of veterinary medicine, the parent committee confirmed that the all necessary conditions for starting the work of Veterinary Faculty are acomplished. According this, the Ministry of Education and Sport adopted decision on 20.4.1994, which verified founding and working of the Veterinary Faculty in Republic of Macedonia.

On the request of the Veterinary Faculty, the Main Court - Skopje 1, on 26.04.2000 adopted decision for changing the name of the Veterinary Faculty in **Faculty of Veterinary Medicine (FVM)**.

The Goverment of Republic of Macedonia, within its rights and obligations, on sugestion of Ministry for Education and Science, adopted Decision for embedding of the Veterinary Institute to the Faculty of Veterinary Medicine, on 20.10.2003.

2. Previous education activity

With founding of the Faculty in 1991, a study curriculum was adopted, which greatly resembled to other curricula from the faculties of former Yugoslavia, but adapted to local possibilities and staff and facilities capacities.

With separation from the Agriculture Faculty a revision of the curriculum was made, some courses were dropped out, and some new were introduced. This study curriculum had 5 years (10 semesters) with total number of 4710 lessons (2580 lessons theoretical and 2130 lessons practical teaching), and now is defunct.

In the academic year 2003/2004 a working group on FVM-S was formed, with task of making new study curriculum and reorganization of the teaching process in FVM-S. As basis for its work, the group used proposal-curriculum which was made within activities of the Tempus project "Improvement of the veterinary education in Republic of Macedonia" (Joint

European Project No CD-JEP-15017-2000). The working group made fundamental analysis of many curricula of accredited European faculties, as well as much new knowledge in the field of biomedicine, which were not included in the old curriculum. Additionally, during the process of evaluation, the Faculty was visited by the previsitation committee of The European Association of Establishments for Veterinary Education (EAEVE), where FVM-S is full member. The committee gave useful and worthful advices about the deficiencies of the education process, which should be corrected. The most of suggestions which concerned the curriculum were reviewed and implemented in the new curriculum which was in force from academic year 2006/2007.

Taking into account acquired experiences and suggestions received, but also specificities of the veterinary profession in Macedonia, the Faculty prepared contemporary study curriculum according the principles and requirements of the Bologna Declaration with introducing the European Credit Transfer System (ECTS) which obtained easily recognition of the diploma and wide mobility of the professors/students within European education area.

With adopting of the Law on High Education (LHE, Of. Gaz. of RM 35/2008 from 14.03.2008) and its changing and additions (Of. Gaz. of RM 103/2008 and 26/2009) and the need of implementation of its regulations, especially the transitional and final regulations (art. 180), some harmonization of educational and science activity of Faculty of Veterinary Medicine in Skopje with legal requirements has to be made, especially in the study curriculum. According the article mentioned above, high education institutions are compulsory to harmonize their study programs with the legal requirements until academic year 2009/2010.

According this, there was need for changing, adding and harmonizing the existing curriculum, and for that purpose a Committee was formed.

After the consultations with course professors the Committee made the project for changes and additions of the study curriculum harmonized with the requirements of the LHE.

Taking into account the exceptions which concern study curricula of the regulated professions, in which veterinary profession also belongs (*Directive 2005/36/EC of the European Parliament and of the Council of 7th September 2005; The European Communities [Recognition of Professional Qualifications] Regulations 2007 No. 2781 from 19th October 2007*) with the changes and additions of the study curriculum of Faculty of Veterinary Medicine in Skopje since academic year 2009/2010 in force are integrated studies of first and second cycle.

The study on FVM-S with adopted changes and additions of the study curriculum still has duration of 5.5 years (11 semesters), and all made changes are reflection of following the actual conditions in the

veterinary profession in the country and in European Union, in the world veterinary science, and also in the social conditions, especially in the agriculture and in economy in total.

3. Personnel

The integrated study of veterinary medicine on Faculty of Veterinary Medicine in Skopje is realized by teachers and assistants of the Faculty, with exception of the courses Biostastatistics and Biophysics, which are realized by the teachers from Faculty of Electrical Engineering and Information Technologies and Faculty of Natural Sciences and Mathematics, respectively, within the University "Ss. Cyril and Methodius" in Skopje.

II

MANAGEMENT AND ORGANIZATION OF FVM-S

1. Management

According the Low for High Education and the Statute of the University "Ss. Cyril and Methodius" - Skopje, management of the Faculty is realized by these bodies:

- ***Dean*** - management body of the Faculty. The dean is assisted by two vice-dean (for education and for science)
- ***Faculty administation*** - body of the Faculty consisted of the dean, vice-deans, directors of the institutes and president of the Student Parliament of Faculty of Veterinary Medicine
- ***Education-Science Council*** - expert body consisted of elected full profesors, associated profesors and assistant profesors, and represents of the students from the Faculty elected by the bodies of Student Pariament

Dean of the Faculty

Prof. d-r Dine Mitrov *(mitrov@fvm.ukim.edu.mk)*

Vice-dean for Education

Prof. d-r Igor Ulchar *(iulcar@fvm.ukim.edu.mk)*

Vice-dean for Science

Prof. d-r Zehra Hajrulai-Musliu *(zhajrulai@fvm.ukim.edu.mk)*

Secretary of the Faculty

Ana A. Ordanoska, lawyer

Faculty administration

Dr. Dine Mitrov, associated profesor
Dr. Igor Ulchar, associated professor
Dr. Zehra Hajrulai-Musliu, associated professor
Dr. Vlatko Ilieski, full professor
Dr. Slavcho Mrenoshki, associated professor
Dr. Dean Jankuloski, assistant professor

Aleksandar Ginovski, student

2. Organization structure of the Faculty

For realizing its activity, the Faculty is organized in education-science organization units - **institutes**. Within the institutes are departments, laboratories, centers and clinics. Professional-administrative

issues are done by the professional service. The library within the Faculty participates in creation of the policy of the library work within the integrated library system of the University.

Education-science organization units

- Institute for Food
- Veterinary Institute
- Institute for Reproduction and Biomedicine

Professional Service

- Student Affairs
- Unit for main, legal and finance issues

Address of the Faculty

Lazar Pop-Trajkov 5-7, 1000 Skopje, R. of Macedonia

Tel:

++ 389 2 3240 700

Fax:

++ 389 2 3114 619

Web:

http://www.fvm.ukim.edu.mk

3. Teaching staff

The Faculty of Veterinary Medicine has integrated studies of first and second cycles and studies from third cycles (doctoral studies). Teaching on the integrated studies of first and second cycles on the Faculty of Veterinary Medicine is made by full professors, associated professors, assistant professors, teaching assistants and younger assistants.

Full professors

- Prof. Mihajlo Adamov, PhD
- Prof. Risto Prodanov, PhD
- Prof. Misho Hristovski, PhD
- Prof. Velimir Stojkovski, PhD
- Prof. Toni Dovenski, PhD
- Prof. Vlatko Ilieski, PhD
- Prof. Plamen Trojachanec, PhD
- Prof. Vladimir Petkov, PhD
- Prof. Romel Velev, PhD

Associated professors

- Prof. Dine Mitrov, PhD
- Prof. Igor Ulchar, PhD
- Prof. Pavle Sekulovski, PhD
- Prof. Zehra Hajrulai-Musliu, PhD
- Prof. Blagica Sekovska, PhD
- Prof. Slavcho Mrenoshki, PhD

Assistant professors

- Ass. prof. d-r Goran Nikolovski, PhD
- Ass. prof. d-r Jovana Stefanovska, PhD
- Ass. prof. Lazo Pendovski, PhD
- Ass. prof. Florina Popovska-Perchinik, PhD
- Ass. prof. Dean Jankuloski, PhD
-

Teaching assistants

- Ass. Igor Esmerov, PhD
- Ass. Aleksandar Dodovski, MS
- Ass. Katerina Blagoevska, MS
- Ass. Radmila Chrcheva-Nikolovska, MS
- Ass. Sloboden Chokrevski, MS
- Ass. Nikola Adamov, MS
- Ass. Iskra Cvetkovik, MS
- Ass. Ksenija Ilievska, MS
- Ass. Kiril Krstevski, MS
- Ass. Irena Celeska, MS
- Ass. Igor Dzhadzhovski, MS
- Ass. Branko Atanasov, MS

III

PREMISES AND EQUIPMENT OF FVM-S

Teaching process is realized in premises of FVM-S, with exception of teaching of course Biophysics which is realized on Faculty of Natural Sciences and Mathematics.

FVM-S has one amphitheatre and two lecture rooms with total of 160 seats for realization of teaching. The lecture rooms are equipped with modern audio-visual equipment (videobeam, graphoscope, episcope, slide-projector, TV and video equipment) and personal computers which are linked on the intranet of the Faculty and also have internet access.

For practical teaching students have 5 practical rooms (for chemistry, biochemistry, physiology and patophysiology; for microbiology, infection diseases and poultry diseases; for parasitology; for pharmacology and toxicology and for internal diseases), 3 classrooms (microscopic room; radiology room and computer room), 2 section halls (anatomy hall and obduction hall for pathology) and 1 hall for anaesthesia and surgery within Clinic for pet animals.

Clinical practice is realized on some commercial farms for diary cows and sheep, swine and poultry farms, fisheries and many veterinary ambulances according made contracts for cooperation.

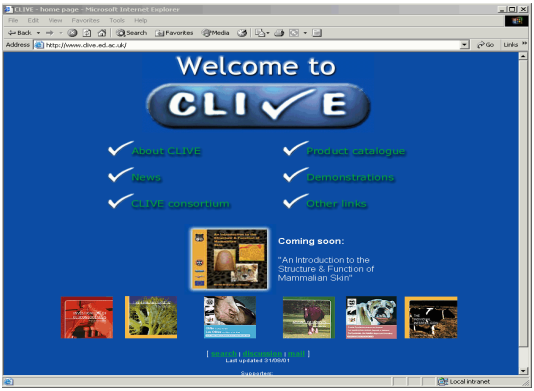
Faculty also has a computer room within the library with 10 new computers, with internet access, and also with access to *CLIVE* data base

With realization of the Tempus project *CD JEP-15017-2000* "Improving of the veterinary education in R. of Macedonia" the Faculty became associate member of the *CLIVE* consortium. With this the Faculty has got opportunity for using the computer educative programs issued by this consortium in its teaching programs.

Enrichment of the library with new titles of computer educative materials, as well as the equipped computer center, allows to the students, not only using the *CLIVE* educative programs, but also easier access to internet and to main international data bases from the field of the veterinary medicine.

Computer center is designed for use by students and professors of the Faculty with purpose of organizing modular teaching. This approach modernized teaching and allowed easier application of ECTS. For the students more than 70 educative programs from the *CLIVE* package are available.

These programs also could be used by the doctors of the veterinary medicine who are interested for continued professional development and by the student from the related fields as medicine, agriculture and biology science. For this purpose an informative brochure with abbreviated preview of the computer educative programs in the computer center is prepared.



Teaching staff has access to 80 computers linked into intranet and permanently connected to internet.

Some equipment which is used on Faculty for research and commercial purposes (microscopes, ultrasonic devices, roentgen apparatus, biochemical analyzers etc.) also could be used for teaching needs.

Faculty has a library which is computerized and has library fund of more than 3000 books, textbooks, bulletins, monographs, proceedings, periodicals etc.

FVM-S is a member of *Central European Exchange Program for University Studies* (CEEPUS). This is program for interuniversity cooperation and mobility (exchanging of students and teachers) within an established network. Network cooperation is made between least three universities, and commonly is realized in sector on university level for realizing different main objectives and definition of applications for mobility of students and teachers. The program started in 1993, and now in force is the contract *CEEPUS II*, signed in 2003. Actual contract sides are Albania, Austria, Bulgaria, Croatia, Czech Republic, Macedonia, Hungary, Poland, Romania, Serbia, Montenegro, Slovakia and Slovenia.

Universities linked into networks of *CEEPUS II* have obligation of total recognition of the study or training period in the partner universities, and the basis for each other recognizing is ECTS or some other compatible system. For relieving of the academic mobility, courses and/or lectures are in English, German or French. The students who study within *CEEPUS II* are exempt from registration and/or scholarship.

Since 2006, FVM-S is a member of the regional network of veterinary faculties VetNEST *(Veterinary Network of European Student and Staff Transfer)* which core is founded in 1993 by the faculties in Brno, Budapest, Kosice, Ljubljana and Vienna. In 2003 new members of this network become the faculties in Zagreb and Wroclaw, and in 2006 the faculties in Tirana and Sarajevo.

In 2008/2009 academic year FVM-S got 5 visits for students with duration of 4 months (one semester) and 5 visits for teaching staff with duration of 1 month per person. Also, visits of 1 teacher and 2 postgraduate students to FVM-S were realized.

Coordinator of VetNEST network on FVM-S is prof. d-r Zehra Hajrulai-Musliu.

IV

STUDENT PARLIAMENT AND OTHER FORMS OF STUDENT ORGANIZING ON FVM-S

1. Participation of students in management

With enrolling on FVM-S, every student becomes a member of the Student Parliament of the Faculty. The Student Parliament allows to the students realizing of common interests as a partners in the process of high education. As a part of academic community, students of the Faculty are driving force in the implementation of the Bologna Declaration and in the process of introducing new European standards in the veterinary profession.

The students participate in the management of the Faculty via their represents who are elected in the Student Parliament according regulations given by the law and by University Statute.

The students of FVM-S are electing three represents who participate in the work of meeting of Education-Science Council of the Faculty. The represents are elected on immediate, fair and democratic elections, according special criteria regulated with rules. The mandate of the represents of the Student Parliament is 2 years, with right of one consecutive reelection.

Represents of the Student Parliament of the Faculty are also members of the Student Parliament of the University. They are also elected by the Student Parliament of the Faculty with mandate of 2 years. The number of the represents of each faculty in Student Parliament of the University is regulated proportionally with the number of the students on the Faculty.

The financing of the Student Parliament of the University and of the faculties is regulated with special rules for financing and with the Statute of the Student Parliament of the University.

In the Student parliament members with equal rights are also at least one represent of student self-organizing forms of the University, regulated by act of Student Parliament.

Student Parliament of the University has a President, who is elected on secret and immediate elections with mandate of 2 years, without right of one consecutive election. The procedure of nomination and election is regulated with the Statute of the Student Parliament of the University. The rules are adopted by the Student Parliament of the University. The work of the Student Parliament of the University and of the faculties is regulated with the Statute of the Student Parliament of the University

2. International Veterinary Student Organization - Macedonia (IVSA Macedonia)

International Veterinary Student Organization (*IVSA*) is international veterinary student association founded in 1951 in Utrecht, Netherlands. Association has more than 50 members around the world and is continualy involved in making connections with countries which are not its members. *IVSA* Macedonia on Faculty of Veterinary Medicine in Skopje become a member of the big *IVSA* family on 20.07.1994 after the summer congress in Berlin. Our local committee for *IVSA* membership is registrated with the constitutional name of our country.

IVSA Macedonia within the world *IVSA* based in Copenhagen has this objectives and tasks: improvement of the quality of the study, ehchanging of experience and informations, helping each other (donation of books and other teaching stuff), allowing work on science projects, introduction with new knowledge in veterinary medicine, as well as organizing group and individual exchanges with students, participation of students on simposia and congresses in organization of world *IVSA*, on local meetings in organization of particular faculties of veterinary medicine, and all that with goal of making bigger activity and information of the students - members of *IVSA*.

In previous period, *IVSA* Macedonia successfuly works and acts because of engagement of all student who were or are still its members, as well as because of the support which *IVSA* Macedonia gets this 12 years from FVM-S. The successes are seen via activities which *IVSA* Macedonia has been realized in the last years. This activities include participation on the all congresses and simposia since 1994, realization of many group exchanges, summer student practice in almost all countries in Europe and USA, organization of *IVSA Macedonia "Lake Week"* and many other *IVSA* activities. *IVSA* Macedonia makes acception of new members at the start of every academic year. Members could be all the student of the Faculty, regardless of the study year.

V

TEACHING, RESEARCH AND APPLICATIVE ACTIVITIES OF FVM-S

Faculty of Veterinary Medicine - Skopje has teaching, research and applicative activity in field of veterinary medicine and veterinary public health.

Mission of FVM-S is realized via organizing study, transfer of knowledge, development and promotion of the education and science in veterinary health in RM, development of creative abilities, preparing students for profession of doctor of veterinary medicine which needs professional knowledge and ability for scientific approach in the work, promoting of the technological development of the veterinary profession and building positions for the future.

Besides the care for the animal health, veterinary medicine has important role in the public health via obtaining healthy and quality food from animal and plant origin. Veterinarians, with their undisputable role in the production and trade of food are promoting confidence of the consumers and successfulness of the livestock production. The big importance of the veterinary profession which is based on the quality education is proved with investigations made within project *VET 2020 (Socrates Thematic Network Project).*

In its applicative activity, FVM-S is also focused on the implementation and maintaining of the *ISO 9001:2000* and *ISO 17025* standards with purpose the service for fulfilling requirements of the clients to be on significantly higher professional level.

The realizing of teaching mission of the Faculty is done by organizing of integrated studies of first and second cycles, as well as studies of third cycles (doctoral studies) with getting scientific degree doctor of veterinary medicine and doctor of science in the field of veterinary medicine.

Methods of work which are for realizing the Faculty's policy are:

- Team work of many professional-scientific staff with special profile, depends on nature of the problem which is subject of analysis, treatement and solving.
- Application of ambulance and hospital approach of treating, with perception of the causes and consequences for manifestation of disorders, with building and sugesting measures for their removement, mitigating and preventing of side complications.
- Application of scientific-statistical methods in the scientific and applicative approach, which spreeds knowledge concerning rules which follow technology of animal production, which has esspecial importance if taking in account strong requirements of the European and world market in trade of lifestock and products of animal origin.

Within its main activity, Faculty of Veterinary Medicine applies these ***principles*** of work:

- Scientific principle, which in realization of teaching and research activity e based on application of contemporary scientific knowledge in the field of veterinary medicine and other related scientific disciplines transformed in the practice.
- Principle of reality, which is consisted of evaluation of achieved results, in terms of meeting of results predicated and expected in predicated circumstances and conditions.
- Principle of permanent amplification of the efficiency and quality of the education as a reflection of the creative and working engagement of the teaching staff, and of the engagement of the students themselves.

With scientific improvement of the staff who is dealing with research, education, development and application in field of veterinary medicine, FVM-S makes permanent development of the veterinary medicine, production, reproduction, hygiene and technology of the products from animal origin, as well as and nutrition of domestic animals.

VI

BASIC PRINICPLES OF EUROPE CRETIT TRANSFER SYSTEM (ECTS) STUDY

Faculty of Veterinary Medicine - Skopje started with application of the *European Credit Transfer System - ECTS* in its teaching process since academic year 2006/2007. This is a system of academic recognition of study between the faculties, which goal is making a student who is creatively oriented and appropriately motivated to the study, with mobility on national and international level which allows international competitiveness on the European intellectual market.

ECTS is established in 1989, primarily as a pilot-study within *Erasmus* program with objective of recognition of the study periods abroad of the mobile students via transfer of credits. As a transfer system, ECTS today is speeded in more than 30 countries and it's introduced in more than thousand high education institutions. The 40 countries signers of the Bologna process have identified ECTS as one of the milestones of the European high education area. Many countries have made legal adoption of ECTS in their high education systems, and in others this process is in progress. In most of the countries ECTS became a condition for accreditation. Zurich conference for credit transfer and accumulation, made in October 2002 by the *European University Association* confirmed the central role of ECTS in high education.

ECTS is built on basis of mutual confidence of the high education institutions and is based on three main elements: complete information about the study curriculum and student's engagement; contract for recognition of the study curricula between partner institutions and use of credit units as indicator of the student's engagement (amount of activities of the student in some period during the study).

ECTS credits are numeric values given to the study units (course programs) for description of student's engagement needed for their completion. They reflect the quantum of activity necessary for each course program in terms of total quantum of activity necessary for completing current academic year, presented with lectures, practicals, seminars, terrain work, individual learning and evaluation of knowledge. ECTS is based on total engagement of the student and it is not limited only on the contact lessons (going on lectures and practicals).

ECTS credits in more extent are relative measure of the student's engagement in solving of the study curriculum.

ECTS is based on the principle that 60 credits are equivalent of the load of the regular student during one academic year. Student's load on the regular study curricula in Europe is commonly 1500 to 1800 lessons per year, so one credit is equivalent to 25 to 30 working hours.

ECTS credits could be gained only with successful completing of the regulated tasks and with appropriately evaluation of the achieved educational output. Educational outputs are sets of competencies, which

define what one student would know, understand or do after the completing of one education process, regardless of its duration.

Taking into account the recommendations of the "ECTS guides", guidelines of the University "Ss. Cyril and Methodius", study curriculum of FVM-S includes intensive teaching realization with introduction of "modules" and "block" education of related course programs, rationalization of the teaching programs, decreasing the number of lessons of theoretical teaching, increasing the number of lessons for individual activities, introduction of wide list of elective courses, introduction of new education methods (interactive teaching, seminars, individual projects, individual work, individual practice in veterinary institutions by own choice), introduction of new methods of continuous evaluation of knowledge and transparent system for forming the final grade. With introduction of all mentioned above, student has the central role in the education process with the study curriculum on FVM-S, and the staff and organization structures are subordinated to his/her needs.

VII

STUDY REGULATIONS

1. Organization of study

Integrated studies of first and second cycles on the Faculty of Veterinary Medicine are organized in 5.5 years or 11 semesters.

Course programs (courses) are organized as compulsory, elective and facultative:

- ***compulsory courses*** are obligate enrolled by the student every semester, if conditionality criteria are solved
- ***elective courses*** are enrolled by the student according his/her own choice and own plane for improving his/her education, knowledge and skills and
- ***facultative courses*** have objective to extend student's knowledge from the other fields, besides the veterinary medicine.

2. Study regulations

According the Regulation of unique study regulations on the University "Ss. Cyril and Methodius" in Skopje, as well as Regulation of unique basis of credit-system, the transfer from one to other study program and transfer from one to other high education institution within University "Ss. Cyril and Methodius" in Skopje, the Faculty of Veterinary Medicine applies these study regulations and credit-system:

- Every course of the study curriculum is marked with code, which defines program contents, teaching and learning methods, as well as mode of evaluation of knowledge and grading
- Every course program is defined with exactly regulated number of credit points, which reflect total load of student for solving the course
- Credit points are acquired only by that student who would fulfill conditions for exam and would successfully complete the course program. Conditions which have to be fulfilled by the student for successful completing the course program are defined by the carriers of the course program
- The number of the credit points which have to be acquired by the student for getting some professional preparation is:
    - for one semester to 30 credit points
    - for one year to 60 credit points
- Student in every semester enrolls courses with total of 30 credits
- Student could go to exam of some course program if the conditionality criteria regulated with the course are fulfilled

- Type, character and mode of realization of the final exams on appropriate course programs are regulated by the Faculty
- Faculty within internal student's mobility, regulates conditionality criteria, i.e. previously completed course programs as condition for enrolling next semester or higher year of study
- Conditions and criteria regulated by the Faculty are for allowing student's orientation which courses have to be completed for enrolling next semester or higher year of study according the study curriculum
- Student, who enrolled one-semester courses in *winter* semester, could go on final exam in the January session, and if the exam result is not positive, next opportunities are the other two exam sessions (May/June and August/September). Student who enrolled one-semester courses in *summer* semester, could go on final exam in the June session, and if the exam result is not positive, next opportunities are exam sessions in August/September and January
- Student could enroll course programs from the next semester or higher year of study if the conditions and criteria regulated by the Faculty are fulfilled.
- At the end of each semester an anonym survey for every course separately is done

3. Evaluation of knowledge and grading

Depends of course program's type, the knowledge of the student is evaluated continuously during the teaching process (via periodic evaluations) and in final (with exam).

With the continuous evaluation, student acquires points for each activity regulated with current course program.

Subject of evaluation (points) of the student during the teaching process are presence on lectures, successfully realized practical, successfully realized practical work, writing of essays, terrain work, individual/home work, consultations made, realization of projects, wining of awards and other student activities.

Final grade for successful completing of the course program is sum of the points from periodic evaluations of knowledge, points from regulated activities of the student during the teaching process (presence on lectures, practicals, essays etc.) and peons from the final exam.

Periodic evaluation of knowledge is written, with tests, or oral, depends on course program's type. Written test is organized after the previous notice and its duration is maximum 2 school hours. For one course program maximum 2 to 3 test in one semester could be organized.

The written test is based on multiple choice (at least 4 offered answers and only one is correct) or combination of part made by principle of multiple choice and part consisted of questions with supplementation or other open type of questions (matching, construction).

The number of questions in the written test is according the needs and specificities of the course program.

The course program is consider to be successfully completed if the student with periodic evaluation of knowledge and with regulated activities acquires at least 60% from possible 100% peons regulated with the course program.

In some course programs if the student did not get positive result in one or two of regulated periodic evaluations of knowledge, the teacher could organize written or oral final evaluation of knowledge, which would concern periodic evaluation which was not successfully completed.

Student could reach the final evaluation of knowledge (final exam) on some courses, if the minimum points form regulated activities (lectures, practicals, essays etc.) and periodic evaluation of knowledge regulated with current course program are acquired.

Final exam from the current course program could be oral, i.e. practical (part of the practical teaching) or written. In general, subject of the final exam could not be another evaluation of the knowledge that student successfully demonstrated during periodic evaluation. The questions of the written or oral final exam must be included in the offered program and/or in the question list, i.e. computer question base.

The answers of the questions must be included in the available main textbooks previously approved with the course programs by the Education-Science Council of the Faculty and issued on public place (bulletin board), and given in the informative package and/or on the web site of the Faculty at the start of the academic year.

The final exam, in general, is organized in one part. If it is written, it could take time at least 1 and maximum 2 school hours. The results of the written exam have to be published within 2 days after the day of exam. This time can be longer, if are some justified reasons, which is decided by the vice-dean for education. Student has right to insight of the written final exam within three days after the publishing of exam's results, or in term noted by the course teacher.

If the final exam is oral, it is organized as public exam with presence of other students. The final result (points acquired) is noted by the course teacher after the realization of the exam.

In the most of courses the final grade (total of acquired points) the presence on the theoretical teaching participates with maximum 15%, the presence and activity (knowledge) on the practical teaching participates

with maximum 30%, essays and home works with maximum 10%, tests with maximum 20%, and final exam with maximum 25% from possible 100%.

Course program is considered for successfully completed if the student acquired at least 60% from possible 100% of the course program.

In some course if the student during the testing did not made positive result in one or in two of regulated evaluations, but have acquired minimal regulated number of points for presence on lectures and practicals, he/she could reach the complete final exam. The complete final exam is combination of the periodic evaluation of knowledge (for the part where the result was not positive) and the final exam.

Student has right to reach the final exam of current course program 3 times within one year from the enrolling the course program.

The final grade of the course program is quantitative with numerical point value and grade appropriate with point value, from 5 (five) to 10 (ten). Grade 5 (five) is evaluation of student who did not successfully completed the current course program, i.e. grade 5 (five) denotes nonsuccess.

Points	Grade
to 59	5 (F)
60-68	6 (E)
69-76	7 (D)
77-84	8 (C)
85-92	9 (B)
93-100	10 (A)

Successfully completed course programe is condition for student to acquire appropriate number of credits regulated with the course programe. Elements which are neccessary for successfull completing of particular course programes, conditions for reaching evaluations of knowledge, exam demands, form and mode of evaluation of knowledge and grading are regulated in the course programes.

Course programs are made by course teachers with agreement of the vice-dean for education, and confirmed by the Education-Science Council.

Final grade is acquired for both the compulsory and elective course programs. Facultative course programs are not graded, but regularly realization of the regulated activities within the course, is condition for acquiring the credit.

4. Exam sessions

Final evaluation of knowledge (exam) is organized in three exam sessions:

1. January *(from 8th of January to 1st of February),*
2. May-June *(from 15th of May to 15th of June)*,
3. August-September *(from 15th of August to 15th of September)*.

According to Statute of the University, Education-Science Council of FVM-S based on adopted University calendar at least 3 months before ending of the actual academic year adopts and publish ***calendar for teaching and non-working days for the next academic year***.

The terms for exams for every session are timely scheduled at the end of each semester and are listed on the bulletin table and/or on the web site of the Faculty.

Maintaining, conducting and administrative support of the students during the study are regulated by the acts of the University.

5. Academic year, semestral teaching

- Academic year starts on 15th of September, and ends on 15th of May next year.
- Teaching in winter semester starts on 15th of September, and ends on 31st of December (15 weeks).
- Teaching in summer semester starts on 1st of February, and ends on 15th of May the same year (15 weeks).

6. Credit Transfer System Coordinator

Faculty credit-coordinator
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VIII

SIZE AND ORGANIZATION OF THE STUDY PROGRAM

According whole changes in the society, nowaday doctor of veterinary medicine is faced with significantly different and more complex promblem than the veterinarian in the past. Because of that, esspecial importance was to make conditions for study which result would be educated vetererinarian who is prepared for continuous education during all his/her professional life, all that with goal of improvment the capability of giving high professional service.

New in the changed study curriculum is introduction of structure which allows more successfull solving the matter and skill neccessary for working with pat animlas and equids, farm animals and in the field of food safety and public health. Teaching within study programe also allows solving of communication and professional behaviour skills.

Study curriculum is formulated in mode whith which the student is stimulated for individual work. Lectures are problem-solving based, and with seminars students are motivated for individual solving of some problems, professional communication and team work. Practicals programe is based exclusively on solving skills neccessary for future professional work.

Knowledge of the student during the study is evaluated with periodic evaluations and transparency in forming of the final grade via point scale with which activity, effort and knowledge for each course programe is scored.

According to legal regulations in Law of Higher Education, European Directive 2005/36/EC for recognition of the professional qualifications *(Directive 2005/36/EC of the European Parliament and of the Council of 7th September 2005)* and recomendations given by EAEVE, changed study curriculum of the Faculty of Veterinary Medicine includes:

- introduction of teaching courses which were not realized in previous study curriculum, but are inclided in Eurepean Directive 2005/36/EC;
- changes in the schedule of some teaching courses by year of study;
- intensive teaching with rationalization of some teaching courses;
- decreasing the number of lessons of theoretic teaching and increasing the number of the lessons for individual activities;
- introducing the elective courses for every year of study and increasing the number of offered elective courses visavie compulsory;
- changes in structures of teaching realization in some courses (lectures, seminars, practicals) and introducing new learning methods: individual projects, individual work,

individual practice in veterinary institutions by own choice, etc.

- realization of 10% of teaching courses in every year of study via practical (clinical) teaching with outstanding experts from the practice;
- organization of compulsory practical teaching with duration of at least 10% per year;
- new methods of periodical evaluation of knowledge and and transparent system in forming of final grade.

SIZE AND ORGANIZATION OF THE STUDY CURRICULUM

1 semester	*2 semester*	*3 semester*	*4 semester*
Anatomy of animals (10.0 ECTS)	Anatomy of animals (9.5 ECTS)	Physiology of animals (6.0 ECTS)	Physiology of animals (8.5 ECTS)
Histology with embryology (2.5 ECTS)	Histology with embryology (5.0 ECTS)	Nutrition of domestic animals (4.5 EKTC)	Nutrition of domestic animals (4.5 EKTC)
Biophysics (5.0 ECTS)	Nutritious, healing and poisonous plants (3.0 ECTS)	Husbandry (4.5 ECTS)	Husbandry (4.5 ECTS)
Cell biology (5.0 ECTS)	Biochemistry (9.0 ECTS)	Animal hygiene (4.5 ECTS)	Animal hygiene (2.0 ECTS)
Chemistry (5.0 ECTS)	Ethology and animal welfare (2.0 ECTS)	Microbiology (4.5 ECTS)	Microbiology (4.5 ECTS)
Biostatistics (2.5 ECTS)	Elective course (1.5 ECTS)	Rural economy (2.0 ECTS)	Immunology (2.0 ECTS)
		Elective courses (4.0 ECTS)	Elective courses (4.0 ECTS)

5 semester	*6 semester*	*7 semester*	*8 semester*
Pathophysiology (5.5 ECTS)	Pathophysiology (4.0 ECTS)	Internal diseases of pet animals and equips (5.0 ECTS)	Internal diseases of pet animals and equines (4.0 ECTS)
Pharmacology (5.5 ECTS)	Pharmacology (5.5 ECTS)	Reproduction (7.0 ECTS)	Reproduction (9.0 ECTS)
Pathology (5.5 ECTS)	Pathology (7.0 ECTS)	Infectious diseases of domestic animals (6.0 ECTS)	Infectious diseases of domestic animals (4.0 ECTS)
Parasitology and parasite diseases (5.5 ECTS)	Parasitology and parasite diseases (4.5 ECTS)	Internal diseases of farm animals (6.0 ECTS)	Internal diseases of farm animals (5.0 ECTS)
Clinical anatomy of animals (3.0 ECTS)	Basis of clinical and laboratory diagnostics (4.0 ECTS)	General surgery with anesthesiology (6.0 ECTS)	Special surgery with orthopedics (5.5 ECTS)
Elective courses (4.0 ECTS)	Diagnostic imaging (3.0 ECTS)		Elective courses (2.5 ECTS)
	Clinical biochemistry (2.0 ECTS)		

9 semester	*10 semester*	*11 semester*
Hygiene and technology of meat, fish, eggs and honey (3.5 ECTS)	Hygiene and technology of meat, fish, eggs and honey (4.0 ECTS)	Clinical practice: pet animals (3.0 ECTS)
Hygiene and technology of milk (4.0 ECTS)	Food safety and veterinary public health (4.0 ECTS)	Clinical practice: farm animals (3.0 ECTS)
Biology and pathology of fish (4.0 ECTS)	Biology and pathology of bees (2.5 ECTS)	Practice in food industry facilities (3.0 ECTS)
Ophthalmology (2.0 ECTS)	Biology and pathology of wildlife (2.0 ECTS)	Elective courses from group 1, 2, 3 or 4 (4.0 ECTS)
Special surgery with orthopedics (4.0 ECTS)	Avian diseases (6.5 ECTS)	Individual practice outside the Faculty (7.0 ECTS)
Veterinary epidemiology (2.0 ECTS)	Basis of management with management of veterinary practice (3.5 ECTS)	Preparation and awarding of diploma work (10.0 ECTS)
Veterinary legislative (2.0 ECTS)	Forensic veterinary medicine and veterinary ethics (3.5 ECTS)	
Herd health management (2.5 ECTS)	Elective courses (4.0 ECTS)	
Veterinary toxicology (2.0 ECTS)		
Elective courses (4.0 ECTS)		

*** Total number of credits: 330**

*** Participation of compulsory courses is not more than 75% from the whole study program**

*** 10% of compulsory and 10% of elective courses in every year of study will be organized by clinical practice**

During the first ten semesters the student has to enroll and complete compulsory basic, pre-clinic and clinic teaching courses (s.c. core), as well as some of the offered elective courses.

The eleventh semester is for getting practical experience and skill from the veterinary practice via compulsory rotation on clinics for pet animals, for farm animals and ambulatory clinic.

Also, within tendencies for specialized accessory education (student directing, s.c. tracking), in this semester every student, depends of his/her own choice and number of free places, has opportunity to choose particular courses from the four groups of elective courses related with current direction (1. pet animals; 2. farm animals; 3. hygiene of the animal products and veterinary public health and 4. biology and pathology of fish, bees, wildlife, animal hygiene, ecology and ethology). Students would be directed thus on the start of the eleventh semester, from the four possible directions (mentioned above), they would choose a primary and an alternative direction. If the number of applications on some direction is bigger than number of free places, in enrollment of the primary direction, better students would be preferred. The score of the student would be determined with acquired ECTS credit points and average grade till enrollment of the eleventh semester.

During the eleventh semester student has obligation to realize 210 working hours individual practice in some veterinary institution (s.c. extramural practice) for becoming familiar with spectrum of his/her future profession.

As a confirmation of successfully completing the basis of scientific work, student in the eleventh semester has to apply, prepare and award a diploma work. Student would be able to award finished diploma work after acquiring of total of 320 credit points, and successful awarding takes 10 points.

Student who would finish integrated academic studies of first and second cycle with duration of 5.5 years (11 semesters) and acquire 330 credit points gets diploma and diploma supplement for graduation on Faculty of Veterinary Medicine and gets professional title **doctor of veterinary medicine (DVM)**.

With finishing the academic studies on FVM-S, student is getting competencies for:

- healing the animals;
- solving issues from veterinary public health;
- participation in environment protection;
- performing therrain, clinical and laboratory diagnostics;
- preventing supressing of infectious diseases and zoonoses;

- projecting and participation of designing programes for development and improovment of lifestock production and production of animal products, and
- development of all types of animals and environment protection, maintance of ethics and human treating of the animals.

IX

ORGANIZATION OF THE STUDY PROGRAM BY YEAR

I YEAR (1st and 2nd semester)

Compulsory courses

Code of the course program	Name of the course program	Semester				Total hours	Credit points (C.P.)
		1 (Winter)		2 (Summer)			
		Lect.	Pract.	Lect.	Pract..		
FVM111	Anatomy of animals	60	75	60	75	270	19.5
FVM112	Cell biology	30	30			60	5.0
FVM113	Biophysics	30	30			60	5.0
FVM114	Chemistry	30	30			60	5.0
FVM115	Biostatistics	15	30			45	2.5
FVM116	Histology with embryology	15	15	30	45	105	7.5
FVM117	Biochemistry			60	60	120	9.0
FVM118	Nutritious, healing and poisonous plants			15	30	45	3.0
FVM119	Ethology and animal welfare			15	15	30	2.0
	Elective course			15		15	1.5
	Total	**390**		**420**		**810**	**60.0**

Elective courses

Code of the course program	Name of the course program/ (lectures + practicals)	Total teaching hours	Credit points (C.P.)	Semester
FVM001	Introduction in veterinary medicine	15	1.5	2

II YEAR (3rd and 4th semester)

Compulsory courses

Code of the course program	Name of the course program	Semester				Total hours	Credit points (C.P.)
		1 (Winter)		2 (Summer)			
		Lect.	Pract.	Lect.	Pract..		
FVM211	Physiology of animals	45	30	60	60	195	14.5
FVM212	Nutrition of domestic animals	30	30	30	30	120	9.0
FVM213	Husbandry	30	30	30	30	120	9.0
FVM214	Animal hygiene	30	30	15	15	90	6.5
FVM215	Microbiology	30	30	30	30	120	9.0
FVM216	Rural economy	15	15			30	2.0
FVM217	Immunology	15	15			30	2.0
	Elective course(s)	60		60		120	8.0
	Total	**435**		**390**		**825**	**60.0**

Elective courses

Code of the course program	Name of the course program/ (lectures + practicals)	Total teaching hours	Credit points (C.P.)	Semester
FVM003	Environment protection (15+0)	15	1.0	3
FVM004	Animal ecology (15+15)	30	2.0	3
FVM005	Ecotoxicology (15+15)	30	2.0	3
FVM006	Chemistry of natural compounds (15+15)	30	2.0	3
FVM007	Anatomy of exotic and laboratory animals (15+30)	45	3.0	3
FVM008	Protection and management with endangered animal species (6+24)	30	2.0	4
FVM009	Production of bulky feed (15+15)	30	2.0	4
FVM010	Zoology of wildlife (15+15)	30	2.0	4
FVM011	Welfare of fish (15+15)	30	2.0	4
FVM012	Beekeeping (15+15)	30	2.0	4
FVM013	Economics and organization of livestock production (30+15)	45	3.0	4

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III YEAR (5th and 6th semester)

Compulsory courses

Code of the course program	Name of the course program	Semester				Total hours	Credit points (C.P.)
		1 (Winter)		2 (Summer)			
		Lect.	Pract.	Lect.	Pract..		
FVM311	Pathophysiology	30	30	30	30	120	9.5
FVM312	Pharmacology	30	30	45	30	135	11.0
FVM313	Pathology	30	30	45	60	165	12.5
FVM314	Parasitology and parasitic diseases	30	30	30	45	135	10.0
FVM315	Clinical anatomy of animals	15	30			45	3.0
FVM316	Basis of clinical and laboratory diagnostics	30	30			60	4.0
FVM317	Diagnostic imaging			15	30	45	3.0
FVM318	Clinical biochemistry			15	15	30	3.0
	Elective course(s)	60				60	4.0
	Total	**405**		**390**		**795**	**60.0**

Elective courses

Code of the course program	Name of the course program/ (lectures + practicals)	Total teaching hours	Credit points (C.P.)	Semester
FVM014	Diversity and protection of wild carnivores (15+15)	30	2.0	5
FVM015	Diversity and protection of birds of prey (15+15)	30	2.0	5
FVM016	Diversity and protection of fish (15+15)	30	2.0	5
FVM017	Ornamental aquaculture (15+15)	30	2.0	5
FVM018	Sport and hobby fishing (15+15)	30	2.0	5
FVM019	Basis of cytology diagnostics (15+15)	30	2.0	5
FVM020	Veterinary hematology (15+15)	30	2.0	5

IV YEAR (7th and 8th semester)

Compulsory courses

Code of the course program	Name of the course program	Semester				Total hours	Credit points (C.P.)
		1 (Winter)		2 (Summer)			
		Lect.	Pract.	Lect.	Pract..		
FVM411	Internal diseases of pet animals and equines	30	60	30	30	150	9.0
FVM412	Reproduction	45	60	60	75	240	16.0
FVM413	General surgery with anesthesiology	45	45			90	6.0
FVM414	Infectious diseases of domestic animals	45	30	30	30	135	10.0
FVM415	Internal disease of farm animals	45	45	30	45	165	11.0
FVM416	Special surgery with orthopaedics			30	60	90	6.0
	Elective course(s)			30		30	2.0
	Total	**450**		**450**		**900**	**60.0**

Elective courses

Code of the course program	Name of the course program/ (lectures + practicals)	Total teaching hours	Credit points (C.P.)	Semester
FVM021	Tropical parasitic diseases (15+0)	15	1.0	8
FVM022	Rational application of antimicrobial drugs (15+0)	15	1.0	8
FVM023	Cynology (11+19)	30	2.0	8

V YEAR (9th and 10th semester)

Compulsory courses

Code of the course program	Name of the course program	Semester				Total hours	Credit points (C.P.)
		1 (Winter)		2 (Summer)			
		Lect.	Pract.	Lect.	Pract..		
FVM416	Special surgery with orthopaedics	30	30			60	4.0
FVM511	Hygiene and technology of meat, fish, eggs and honey	30	15	30	30	105	7.5
FVM512	Hygiene and technology of milk	30	30			60	4.0
FVM513	Biology and pathology of fish	30	30			60	4.0
FVM516	Veterinary epidemiology	15	15			30	2.0
FVM517	Veterinary toxicology	15	15			30	2.0
FVM518	Ophthalmology	15	15			30	2.0
FVM519	Herd health management	15	30			45	2.5
FVM520	Veterinary legislative	15	15			30	2.0
FVM514	Forensic veterinary medicine and veterinary ethics			30	15	45	3.5
FVM515	Basis of management with management of veterinary practice			30	15	45	3.5
FVM521	Food safety and veterinary public health			30	30	60	4.0
FVM522	Biology and pathology of game			15	15	30	2.0
FVM523	Biology and pathology of bees			15	30	45	2.5
FVM524	Avian diseases			45	45	90	6.5
	Elective course(s)	60		60		120	8.0
	Total	**450**		**435**		**885**	**60.0**

Elective courses

Code of the course program	Name of the course program/ (lectures + practicals)	Total teaching hours	Credit points (C.P.)	Semester
FVM024	Marketing of veterinary practice (15+0)	15	1.0	9
FVM025	Contemporary food safety systems (15+15)	30	2.0	9
FVM026	Management of animal products supply chains (30+0)	30	2.0	9
FVM027	Microbiology of food (15+15)	30	2.0	9

FVM028	Technologic processes on a poultry farm (15+15)	30	2.0	9
FVM029	Aquaculture (15+15)	30	2.0	9
FVM030	Clinical pharmacology (30+15)	45	3.0	9
FVM031	Food chemistry (30+15)	45	3.0	9
FVM032	Reconstructive surgery of the integumentary system (15+0)	15	1.0	10
FVM033	Selected surgical procedures in ophthalmology (15+ 0)	15	1.0	10
FVM034	Selected techniques for surgical fracture reduction (15+0)	15	1.0	10
FVM035	Advanced reproductive endocrinology (15+15)	30	2.0	10
FVM036	Clinical nutrition of dogs and cats (15+15)	30	2.0	10
FVM037	Tropical infectious diseases (15+15)	30	2.0	10
FVM038	Breeding and diseases of ostriches (15+15)	30	2.0	10
FVM039	Breeding and diseases of pigeons (15+15)	30	2.0	10
FVM040	Organic apiculture (15+15)	30	2.0	10
FVM041	Ecologic control of bee diseases (15+15)	30	2.0	10
FVM042	Management of wildlife diseases (15+15)	30	2.0	10
FVM043	Parasitology in public health (15+15)	30	2.0	10
FVM044	Harmful antinutritive substances in feed (15+15)	30	2.0	10
FVM045	Additives in feed - health modulators (15+15)	30	2.0	10
FVM046	Residues and contaminents in food (15+15)	30	2.0	10
FVM047	Toxicology of poisonous plants (15+15)	30	2.0	10
FVM048	Oncology (30+15)	45	3.0	10
FVM049	Techniques of anaesthesia and analgesia in different pet animals (15+0)	15	1.0	10
FVM050	Veterinary inspection (30+15)	45	3.0	10
FVM051	Changes in laboratory profile in diseases of pet animals (15+15)	30	2.0	10
FVM052	Ultrasonic diagnosis of reproductive disorders in cows (15+15)	30	2.0	10
FVM053	Advanced andrology and cryobiology (15+15)	30	2.0	10

VI YEAR - 11th semester

Compulsory courses

Code of the course program	Name of the course program	Teaching hours	Credit points	Organized as
FVM611	Clinical practice: pet animals	75	3.0	Compulsory
FVM612	Clinical practice: farm animals	75	3.0	Compulsory
FVM613	Practice in food industry facilities	75	3.0	Compulsory
	**Elective courses related with particular direction (from group 1, 2, 3 or 4)*	*60*	*4.0*	*Elective*
FVM614	Individual practice outside the Faculty	210	7.0	Compulsory
	Preparation and awarding of diploma work	150	10.0	Compulsory
	Total	**645**	**30.0**	

**Elective courses related with particular direction*

Group 1 - Pet animals

Code of the course program	Name of the course program / amount of lectures and practicals	Teaching hours	Credit points
FVM007	Anatomy of exotic and laboratory animals (15+30)	45	3.0
FVM017	Ornamental aquaculture (15+15)	30	2.0
FVM019	Basis of cytology diagnostics (15 +15)	30	2.0
FVM020	Veterinary hematology (15 +15)	30	2.0
FVM021	Tropical parasitic diseases (15+0)	15	1.0
FVM023	Cynology (11+19)	30	2.0
FVM024	Marketing of veterinary practice (15+0)	15	1.0
FVM030	Clinical pharmacology (30+15)	45	3.0
FVM032	Reconstructive surgery of the integumentary system (15+0)	15	1.0
FVM033	Selected surgical procedures in ophthalmology (15+0)	15	1.0
FVM034	Selected techniques for surgical fracture reduction (15+ 0)	15	1.0
FVM036	Clinical nutrition of dogs and cats (15+15)	30	2.0
FVM039	Breeding and diseases of pigeons (15+15)	30	2.0
FVM048	Oncology (30+15)	45	3.0

FVM049	Techniques of anaesthesia and analgesia in different pet animals (15+0)	15	1.0
FVM051	Changes in laboratory profile in diseases of pet animals (15+15)	30	2.0

Group 2 - Farm animals

Code of the course program	Name of the course program / amount of lectures and practicals	Teaching hours	Credit points
FVM009	Production of bulky feed (15+15)	30	2.0
FVM013	Economics and organization of livestock production (30+15)	45	3.0
FVM019	Basis of cytology diagnostics (30+15)	45	3.0
FVM020	Veterinary hematology (30 +15)	45	3.0
FVM021	Tropical parasitic diseases (15+0)	15	1.0
FVM022	Rational application of antimicrobial drugs (15+0)	15	1.0
FVM028	Technologic processes on a poultry farm (15+15)	30	2.0
FVM030	Clinical pharmacology (30+15)	45	3.0
FVM035	Advanced reproductive endocrinology (15+15)	30	2.0
FVM037	Tropical infectious diseases (15+15)	30	2.0
FVM038	Breeding and diseases of ostriches (15+15)	30	2.0
FVM044	Harmful antinutritive substances in feed (15+15)	30	2.0
FVM045	Additives in feed - health modulators (15+15)	30	2.0
FVM047	Toxicology of poisonous plants (15+15)	30	2.0
FVM052	Ultrasonic diagnosis of reproductive disorders in cows (15+15)	30	2.0
FVM053	Advanced andrology and cryobiology (15+15)	30	2.0

Group 3 - Hygiene of animal products and veterinary public health

Code of the course program	Name of the course program / amount of lectures and practicals	Teaching hours	Credit points
FVM006	Chemistry of natural compounds (15+15)	30	2.0
FVM025	Contemporary food safety systems (15+15)	30	2.0
FVM026	Management of animal products supply channels (30+0)	30	2.0
FVM027	Microbiology of food (15+15)	30	2.0
FVM031	Food chemistry (30+15)	45	3.0
FVM043	Parasitology in public health (15+15)	30	2.0
FVM046	Residues and contaminents in food (15+15)	30	2.0
FVM050	Veterinary inspection (30+15)	45	3.0

Group 4 - Biology and pathology of fish, bees, wildlife, animal hygiene, ecology and ethology

Code of the course program	Name of the course program / amount of lectures and practicals	Teaching hours	Credit points
FVM003	Environment protection (15+0)	15	1.0
FVM004	Animal ecology (15+15)	30	2.0
FVM005	Ecotoxicology (15+15)	30	2.0
FVM008	Protection and management with endangered animal species (6+24)	30	2.0
FVM010	Zoology of wildlife (15+15)	30	2.0
FVM011	Welfare of fish (15+15)	30	2.0
FVM012	Beekeeping (15+15)	30	2.0
FVM014	Diversity and protection of wild carnivores (15+15)	30	2.0
FVM015	Diversity and protection of birds of prey (15+15)	30	2.0
FVM016	Diversity and protection of fish (15+15)	30	2.0
FVM018	Sport and hobby fishing (15+15)	30	2.0
FVM029	Aquaculture (15+15)	30	2.0
FVM040	Organic apiculture (15+15)	30	2.0
FVM041	Ecologic control of bee diseases (15+15)	30	2.0
FVM042	Management of wildlife diseases (15+15)	30	2.0

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CONDITIONS FOR ENROLLING HIGHER YEAR OF STUDY

CONDITIONS FOR ENROLLING STUDENTS ON HIGHER YEAR OF STUDY

1 semester	*2 semester*	*3 semester*	*4 semester*	*5 semester*	*6 semester*
Biostatistics (2.5 ECTS)	Nutritious, healing and poisonous plants (3.0 ECTS)	Animal hygiene (4.5 ECTS)	Animal hygiene (2.0 ECTS)	Pathophysiology (5.5 ECTS)	Pathophysiology (4.0 ECTS)
Biophysics (5.0 ECTS)	Ethology and animal welfare (2.0 ECTS)	Nutrition of domestic animals (4.5 ECTS)	Nutrition of domestic animals (4.5 ECTS)	Pathology (5.5 ECTS)	Pathology (7.0 ECTS)
Chemistry (5.0 ECTS)	Biochemistry (9.0 ECTS)	Husbandry (4.5 ECTS)	Husbandry (4.5 ECTS)	Pharmacology (5.5 ECTS)	Pharmacology (5.5 ECTS)
Anatomy of animals (10.0 ECTS)	Anatomy of animals (9.5 ECTS)	Physiology of animals (6.0 ECTS)	Physiology of animals (8.5 ECTS)	Parasitology and parasite diseases (5.5 ECTS)	Parasitology and parasite diseases (4.5 ECTS)
Histology with embryology (2.5 ECTS)	Histology with embryology (5.0 ECTS)	Microbiology (4.5 ECTS)	Microbiology (4.5 ECTS)	Clinical anatomy of animals (3.0 ECTS)	Basis of clinical and laboratory diagnostics (4.0 ECTS)
Cell biology (5.0 ECTS)	Elective courses (1.5 ECTS)	Immunology (2.0 ECTS)	Elective courses (4.0 ECTS)	Elective courses (4.0 ECTS)	Diagnostic imaging (3.0 ECTS)
		Rural economy (2.0 ECTS)			Clinical biochemistry (3.0 ECTS)
		Elective courses (4.0 ECTS)			

= Conditions for enrolling of 3rd semester (II year)

= Conditions for enrolling of 5th semester (III year)

= Conditions for enrolling of 7th semester (IV year)

= Conditions for enrolling of 9th semester (V year)

= Conditions till the end of study

7 semester	*8 semester*	*9 semester*	*10 semester*	*11 semester*
Internal diseases of pet animals and equines (5.0 ECTS)	Internal diseases of pet animals and equines (4.0 ECTS)	Hygiene and technology of meat, fish, eggs and honey (3.5 ECTS)	Hygiene and technology of meat, fish, eggs and honey (4.0 ECTS)	Clinical practice: pet animals (3.0 ECTS)
Reproduction (7.0 ECTS)	Reproduction (9.0 ECTS)	Hygiene and technology of milk (4.0 ECTS)	Food safety and veterinary public health (4.0 ECTS)	Clinical practice: farm animals (3.0 ECTS)
Infectious diseases of domestic animals (6.0 ECTS)	Infectious diseases of domestic animals (4.0 ECTS)	Ophthalmology (2.0 ECTS)	Avian diseases (6.5 ECTS)	Practice in food industry facilities (3.0 ECTS)
General surgery with anesthesiology (6.0 ECTS)	Special surgery with orthopedics (6.0 ECTS)	Special surgery with orthopedics (4.0 ECTS)	Biology and pathology of wildlife (2.0 ECTS)	Elective courses from group 1, 2, 3 or 4 (4.0 ECTS)
Internal diseases of farm animals (6.0 ECTS)	Internal diseases of farm animals (5.0 ECTS)	Biology and pathology of fish (4.0 ECTS)	Biology and pathology of bees (2.5 ECTS)	Individual practice outside the Faculty (7.0 ECTS)
	Elective courses (2.0 ECTS)	Veterinary epidemiology (2.0 ECTS)	Basis of management with management of veterinary practice (3.5 ECTS)	Preparation and awarding of diploma work (10.0 ECTS)
		Veterinary legislative (2.0 ECTS)	Forensic veterinary and veterinary ethics (3.5 ECTS)	
		Herd health management (2.5 ECTS)	Elective courses (4.0 ECTS)	
		Veterinary toxicology (2.0 ECTS)		
		Elective courses (4.0 ECTS)		

= Conditions for enrolling of 11th semester (VI year)

= Conditions till the end of study

= Other courses

XI

MISCELANEOUS INFORMATIONS FOR THE STUDENTS

1. Location of the Faculty of Veterinary Medicine - Skopje

The Faculty is located 4 km from the city center in the settlement Avtokomanda, municipality Gazi Baba. It is placed behind Forestry Faculty with area of circa 7500 m^2 and is consisted of five objects (neto area 3700 m^2) in complex with the Veterinary Hospital. Close to the Faculty is student dormitory "Stiv Naumov".

Address: Lazar Pop-Trajkov 5-7, 1000 Skopje, R. of Macedonia
Tel: ++ 389 2 3240 700
Fax: ++ 389 2 3114 619
Web: http://www.fvm.ukim.edu.mk

2. Conditions and mode of enrolling integrate studies

Integrated studies on FVM-S could be enrolled by person who has finished four-year secondary school and who fulfills conditions and criteria regulated by enrolling competition of University "Ss. Cyril and Methodius".

More precise regulations about conditions and criteria for enrolling of study are determined with Regulations of conditions, criteria and rules of enrolling and study of first and second cycle university study, with Decision on relation of faculties, scientific areas and disciplines and with the Competition published by the Rectorate.

Graduate studies are organized only as regular studies and their duration is 11 semesters.

3. Status of a student

Status of a student, and also a member of the academic community is riched with enrolling of integrated studies of first and second cyclus and doctoral studies (third cyclus) on the Faculty. Status of a student is aprooved with student index and studen identification card.

Student whose education is financed by the state, keeps status of student whose is financed by the state, maximum in time which is twice longer from the regulated time of study duration, i.e. till the end of the academic year of the expiring date. After the expiring date the student continues studies with own expencies for study (cofinancy).

Student whose education is financed by the state could repeat same year of study only once. If in next academic year the righ for enrolling higher year is not fulfilled, student loses status of student whose education is financed by the state, but has righ to enroll the same year again as a student with own expencies for study.

Time of repose of student's obligations is not included in the time mentioned above.

4. Student's rights and obligations

Student has right on:

- quality study and education process as it is regulated in the study program
- free expression of opinions during teaching and other activities on the high education institution
- evaluation of the quality of teaching and teachers
- regular study and status of a regular student
- regular advance, education and finishing study in conditions which were in force in time of enrollment
- enrolling and education by equal condition regulated legally, with statute and with study program
- participation in management of the high education institution, according legal regulations and high education institution's statute
- protection of his/her rights and duties in face of high education institution's bodies and protection of the personality of student from abusement and his/her dignity.

Student has also right to:

- advance and to finish study for shorter time than regulated in study program
- study in same time more study programs from different fields and to reach additional courses
- continue study on other high education institution if the high education institution where he/she is enrolled stops with work
- use library and data bases, premises, equipment (teaching facilities), software and other scientific and professional infrastructure on the University and its units, i.e. on individual high education institution
- participate in research and professional activity where his/her author, inventor and other rights are guaranteed
- elect and to be elected as represent of the students in the bodies of high education institutions
- use service of the student standard (accommodation, health insurance etc.), city and intercity transport according conditions regulated legally by carriers of such activities,
- use university premises for sport and culture activity
- transfer from one to other high education institution, i.e. from one to other study and within that to use advantages of the credit-system

- participate in the work of students organizations
- participate in organizing forms of the students organization regulated by the University's statute
- continue previously interrupted study by conditions regulated with the high education institution's statute
- use holiday at least 60 days within one calendar year
- get state or other grants or to use finance installment for living during study
- realize cooperation with the students in the country and abroad and to reach other rights according the law and high education institution's statute

Student has obligation to:

- fulfill tasks regulated with the study programs
- respect legal regulations, and regulations from high education institution's statute and other inner legal acts
- to apply decisions of the management body, rector, i.e. director of the individual high education institution
- act in harmony with student ethic codex which is prepared and approved by high education institution according student representation

Students from all grades of high education who are orfans, blind, deef, invalides of firs and second grade, mothers of children to 6 years old and hospitalized have right for special benefitions regulated by high education institution's statute.

All rights and obligations mentioned above, are realized by the student in the high education institution in size and conditions regulated by the law and by high education institution's statute. For protection of student's right, every university founds Student attorney.

Jurisdiction, election and work of the Student attorney is regulated by University's statute.

5. Repose of student's obligation

Student's obligations are reposing, on his/her request:

- during pregnancy
- for student with child to 1 year old
- during illness longer than one semester
- on student's request
- in case of repose of working status regulated legally
- in other cases regulated legally or by act of the unit

Decision is adopted by the Dean of the faculty.

6. Expiring the status of a student

Student's status of a student of the Faculty expires according conditions and procedure regulated by main acts of the University.

Status is expired if student:

- graduates
- do not complete study in time regulated legally and with the statute
- do not fulfil condition for enrolling of higher year in time regulated with statute and regulations
- is written out the Faculty
- is excluded from the Faculty

Status could be restored with procedure regulated with University's statute and Faculty's regulations, except if status is not expired with permanent exclusion. Expenses for restoring status are filed by the student.

7. Discipline measures

For violation of duties and unfulfilling the obligation, student of graduate study could be subject of one of following discipline measures: warning, public worning and exclusion.

Exclusion is applied for academic year when is given. Discipline measures are given by Committe for discipline measures on the Faculty.

Discipline committee consists of three members and same number of deputies: one teacher, one assistant and represent of the students on the Faculty. Discipline committee is elected by Education-Science Councile with mandate of two years.

Sugestion for proceeding discipline responsibility culd be given by the Dean or by students organization's bodies. Based on sugestion, discipline committee is questioning student. Calling the student for questioning is made with written invitation. Time from delivering the invitation to questioning must be at least eight days.

Discipline committe cam give measure warning for:

1. violation of public order and peace during teaching
2. indecent behaviour with teacher, assistants or other employees, as well as with other students
3. registration of presence of other student
4. negligent treating of property of the Faculty which could result with minor damage

Discipline committee could give public warning or exclusion for:

1. possesion and use of devices for telephone and electronic communication during exams
2. transcribing or giving any help to other student during exams
3. self-willed registration for acquiring points for activity
4. non-allowed having equipment for audio and/or video recording of copyright work, including mobile phones, by the students during performing lectures, practicals or interactive teaching
5. plagiating in form of transfering other student's seminary work or essay on its behalf
6. physic assult with causing light bodily injury
7. physic assult with causing heavy bodily injury
8. verbal or real offending of teacher or assistant
9. giving untruth informations to Faculty's bodies
10. intrusion in the informatic system of the University, i.e. Faculty (web site, electronic files etc.)
11. damage in calculated amount over 100 euros in denar conversion because of uncomplying to regulated rules or reckless treatment of the University's or faculty's property, as well as appropriating objects which are property of University or Faculty.
12. forgeryng any documents, esspecialy signature of teacher, assitants or other persons in the index, or in some other official document, forgeryng grade mark etc.
13. repeated light discipline violations

Student has right of objection against desision of Discipline committee, in time of 8 days, addressed to the Education-Science Council, as a second-grade discipline body. The decision of the Education-Science Council is final.

8. Students' participation of in management

Students are participating in management via their represents who are elected in the Student Parliament on the University and Faculty, according conditions regulated legally and with University's statute.

XII

REGULATIONS FOR DIPLOMA WORK

REGULATIONS
on procedure of application, preparation and awarding of diploma work on Faculty of Veterinary Medicine - Skopje

Article 1

Graduating of students on study program at Faculty of Veterinary Medicine (in text bellow Faculty) is conditioned with application, preparation and public awarding of diploma work.

Article 2

Written diploma work is individual work of the student which shows student's ability of methodologically correct proceeding of theoretical and practical issues, as well as use of basic methods of development and research work, with independently use of literature.

Public awarding of the diploma work is public presentation of the work by the candidate, with use of diverse equipment for clearly presentation of the work, including answering on the questions asked by the committee related with issue which is work's subject.

Article 3

Diploma work is applied in science area maintained on the Faculty and is realized with monitoring of mentor.

Mentor from paragraph 1 of this article is teacher of the course program included in science area of diploma work. Mentor could be only teacher elected and employed on the Faculty.

Article 4

Student gets right of application of diploma after passing all course programs determined by study curriculum, i.e. after acquiring predicted 300 credit points which are condition for enrollment of eleventh semester. Student could award the diploma work after acquiring of total of 320 credit points, and successful awarding takes 10 points.

Article 5

Student can choose theme for diploma work from the suggested list of themes, i.e. areas for making diploma work.

Article 6

List of themes for diploma work is adopted by Education-Science Council at the Faculty before beginning of the academic year and concerns students who have right to enroll eleventh semester.

List of themes from paragraph 1 from this article, could be revised by exception during last semester.

Article 7

Student applies theme for realizing diploma work from the suggested themes with special form (application) which is delivered to the student service.

In the application of diploma work student notes mentor, course program, the theme and science area.

Student service delivers application to the department (mentor), who delivers "confirmation" of applied diploma theme to the vice-dean for education.

Vice-dean for education maintains register of themes chosen for diploma work.

During confirmation of theme, vice-dean for education on suggestion of mentor appoints committee for review and evaluation of realized diploma work.

One copy of confirmed application is delivered to the student service, mentor and candidate.

On request with explanation of the student, and with agreement with the mentor, vice-dean for education can approve realization and awarding of diploma work which theme is not included in suggested list of themes for diploma work.

Article 8

Committee for review and evaluation is consisted of three members. Mentor is the first member of the committee, and one another member is teacher or assistant in science area from which the theme is taken.

Committee could have only 1 assistant.

Committee from paragraph 1 from this article could have maximum one confirmed expert in the area from which theme is taken, in case when the work is realized outside the Faculty.

Confirmed expert is person with 3 years of working experience in issue concerned in diploma work.

Article 9

Diploma work is written and awarded on Macedonian.

Student can start to work on diploma work after acquiring of total of 320 credits, i.e. after acquiring of credits from individual practice outside the Faculty.

Realization of applied diploma work cannot take less than 30 days and more than 90 days from the date of acquiring the credits.

On request with explanation by the student, vice-dean for education can prolong this time, but not more than six months.

If student does not deliverer diploma work in time regulated with paragraph 2 from this article, he/she has to begin procedure for application of diploma work with new theme.

Article 10

Student delivers the work in three printed copies and one copy in electronic form, via Faculty archive to the members of the committee. Electronic copy of diploma work is kept in Faculty's library.

By exception, student could realize and deliver diploma work in English. If the work is written in English, student has to deliver one copy of the work in Macedonian. Electronic copy of the work is compulsorily in Macedonian.

Article 11

Elements which are compulsory content of diploma work are delivered to the students, as template in written and electronic form, during taking forms for application of diploma work in student service.

Article 12

Awarding of diploma work is in public with presence of all members of the committee. If some member of committee is unable to be present on scheduled awarding, vice-dean for education by suggestion of the mentor confirms replacement of the absent member.

Article 13

Realized diploma work is reviewed by the members of the committee and each member delivers written mark grade of the written diploma work to the vice-dean of education. Form for evaluation report of written diploma work is integral part of these Regulations.

In general, awarding of diploma work is made after expiring of 7 working days, estimated from the day of delivery of realized diploma work.

Committee has duty to review and evaluate the work within 5 working days after its admission, and to deliver to vice-dean for education filled form for evaluation of written diploma work.

If all mark grades form members of committee are positive, vice-dean for education confirms and schedules term for public awarding of the work.

Negative mark grade of delivered realized work, is delivered to the student from the committee in writing with explanation. Diploma work which has got negative mark grade could not be awarded.

Article 14

Diploma work is graded with mark grade from 5 to 10. Oral presentation of the candidate is subject of grading by the members of the committee, and final grade of the diploma work is average grade of particular grades of the written part and grade of the oral presentation of work.

Adopted grade is announced in public by the committee after finishing the awarding.

The grade is noted in the record of the awarding, which form is integral part of these Regulations.

The record is signed by all members of the committee.

Arcticle 15

The grade from final evaluation of the diploma work is included in average score of study of the graduated student as mark grade of one exam (final exam).

Successfully awarding of diploma work takes 10 credit points which are included in total amount of credit points neccessary for completing the study program.

Article

Student who had got negative grade on the final exam or did not delivered finished diploma work in regulated time, or had got negative grade on the evaluation, has right to repeat procedure for passing of final exam, but with new theme and new mentor.

Article 17

These Regulations are valid for students enrolled on first year in academic year 2009/2010.

EDUCATION CONTENTS OF

COMPULSORY COURSES

Course	**ANATOMY OF ANIMALS**	**19.5 credit points**
Code	**FVM111**	
Year of study	**First (I)**	
Semester	**First and Second (I and II)**	
Total teaching lessons	**270 (120+150)** **I semester 4+5 (60+75)** **II semester 4+5 (60+75)**	
Course type	Compulsory	
Prerequisites		
Author of the course program	prof. Vlatko Ilieski, PhD ass. prof. Lazo Pendovski, PhD	
Realized by	prof. Vlatko Ilieski, PhD ass. prof. Lazo Pendovski, PhD	
Purpose and objectives of the course program	***Theory classes*** of the course Anatomy of animals aim to introduce students to the scope and field of anatomy, the position of domestic species in zoological system, division the animal body into organ systems, to learn the descriptive terms and the body regions. In the course, the students deathly will be learn the topographical anatomy of locomotors system, separately the topographic anatomy of the front limbs, hind limbs and the spinal cord, the anatomy of the thorax and abdominal wall. The topography of the head and the neck will be studied through the anatomy of bones and muscles, the anatomy of nasal cavity, paranasal sinuses, nasofarynx, larynx, trachea, oral cavity, teeth, tongue, salivary glands, gums, and oesophagus. Students will gain knowledge about the topography of the thorax cavity, the pleura and mediastinum, lung anatomy, review of the conducting airways including the trachea, main bronchi and bronchioles as well the interpulmonal bronchi. During this semester students will become familiar with the topographical anatomy of the heart of various mammalians, studying the functional anatomy of the heart, venous and arterial blood systems of the heart and drainage of large veins, systemic circulation and pulmonary small circulation as well the innervations of the heart. The topographic anatomy of the abdomen (general and comparative), will be studied the body cavities, serous membranes, anatomy of simple and complex anatomy of the intestines, anatomy and topography of the accessory glands of the digestive system (liver, pancreas), topographic anatomy of the pelvic cavity through a description of the urogenital organs, the topography of the kidney anatomy of male reproductive system, the anatomy of the female reproductive system, the terminal branches of the aorta abdominals and mammary glands. Students will become familiar with the organization of the central nervous system studying the skull cavity, brain membranes, anatomy and blood supply of the brain and spinal cord, nerves of head cerebrospinal nerves and ganglia, splanchnic nervous system, sympathetic and parasympatric nervous system, intramural nervous system, the sensory organs, skin, knowledge of the anatomy of the eye, ear (outer, middle and inner ear) with skin (generally and comparatively) skin glands, nails, claws, hooves and horns and ungula. ***Practicals*** of the course Anatomy of animals aim to introduce the students with the general descriptive terms used in anatomy as well with the plains of the body with description of joints and muscles movements. During the practical dissection of cadavers the students will become familiar with the topographical anatomy of the forelimb, hindlimb, topographical anatomy of the column vertebrae, the anatomy of the chest wall and the wall of the abdominal cavity, practically studying the bones, dissection muscles, joints and ligaments, and dissection of blood vessels and nerves. Thought the practical dissection the students will learn the topography anatomy of head and neck through the practical study of bones, joints and ligaments of head and neck (general and comparative), blood vessels and lymph nodes of head and neck, nasal cavity and paranasal sinuses, oral cavity and salivary glands, larynx, trachea, oesophagus, the chest and abdominal cavity, the organs, nerves, blood vessels and lymph nodes in the chest cavity and abdominal cavities. Also through the practical dissection will allow to students to learn the topographic anatomy of the pelvic cavity and its organs, nerves, blood vessels and lymph nodes, topographic anatomy of male reproductive organs, topographic anatomy of female reproductive organs. Students will practically be familiar with the anatomy of brain membranes, anatomy of the brain and spinal cord, the blood vessels of the brain and spinal cord, cranial nerves and ganglia, the eyeball, orbital fascia, muscles of the eyeballs, eyelids and conjunctives, lachrymal system, vascularisation and eye innervations.	

Contents

THEORY CLASSES

No of lessons /weeks	***Teaching unit***	***Contents of teaching unit***
1(1-4)	**BASIC FACTS AND CONCEPTS OF ANATOMY 1**	**Curriculum: Aims** **Lectures:** The scope and field of anatomy, the position of domestic species in the zoological system, division of animal body organ systems, descriptive terms and body regions.
2(5-8)	**BASIC FACTS AND CONCEPTS OF ANATOMY 2**	Organization and classification of bones, the bone marrow, periost. Joints between the bones (joints). Organization and classification of muscles, muscle sheaths, tendons, tendon sheaths and synovial bursa. Peripheral blood vessels and lymph vessels, peripheral nerves. Methods for visual diagnostic anatomy.
Teaching materials for module 1: Video presentation: Functional anatomy of bones and 15:27 min and joints 9:15 min. Slide presentation for bodily planes (7 slides), CLIVE Computer interactive program: Under the skin of the horse - an introduction to parts of the anatomy of the horse. Students will work independently with fresh, fixed and plastinated anatomy samples.		
3(9-12)	**LOCOMOTOR APPARATUS 1 (FORELIMB-1)**	**Curriculum:** Aims **Lectures:** Anatomy of the forelimb: bones of the forelimb (comparatively). Topographic anatomy of the chest region (muscles (origin, insertion, function, topography), innervations, blood vessels, lymph nodes).
4(13-16)	**LOCOMOTOR APPARATUS 2 (FORELIMB-2)**	Topographic anatomy of the shoulder region (muscles and muscle sheaths (origo, insertion, function, topography), innervations, blood vessels, lymph nodes). Topographic anatomy of the elbow region, muscles and muscle sheaths (origo, insertion, function, topography), innervations, blood vessels, lymph nodes).
5(17-20)	**LOCOMOTOR APPARATUS 3 (FORELIMB-3)**	Autopodium the horse and ox, the dog paw joints and ligaments of the forelimb, biomechanics of movement. Clinical anatomy of the forelimb, visual diagnostic anatomy of the forelimb. Peripheral nervous system of the forelimb: clinical aspects and topography of the nerves of the forelimb.
Teaching material: for Module 2 **PowerPoint presentation:** Functional anatomy of the musculature of the forelimb (35 slides), joints of the forelimb 1 (flat wrist and elbow joint) (23 slides), rotation the forelimb 2 (wrist and carpal joints of the fingers) (37 slides), innervations of the forelimb (20 slides), joints of forelimb 3 (finger) (25 slides) Palpation of the bony bumps on the forelimb in live animal. Presentations with dissection: (30 slides) **Video presentation**: Connecting the forelimb 8.45min. Innervations of the forelimb 12.12 min.; CLIVE Computer interactive program (quizzes): Anatomy of the forelimb in a dog: region of the shoulder region of upper arm, forearm region, innervations of the region of elbow. Forelimb in a dog (complete anatomy) Forelimb of a horse 1: Forelimb of a horse 2, Forelimb of a horse 3 Topography of forelimb of bovine. Forelimb in dog 1 (X-ray anatomy), Forelimb of cat (X-ray anatomy) Working with fresh, fixed and plastinated anatomy samples.		
6(21-24)	**LOCOMOTOR APPARATUS 1 (HINDLIMB-1)**	**Curriculum**: Aims Lectures: Anatomy of the posterior limb: bones of the posterior limb (comparatively) Topographic anatomy of the hip region (muscles and muscle sheaths (origo, insertion, function, topography), innervations, blood and lymph vessels, lymph nodes)
7(25-28)	**LOCOMOTOR APPARATUS 2 (HINDLIMB-2)**	**Curriculum**: Aims Lecture: Topographic anatomy of the thigh region (muscles and muscle sheaths (origo, insertion, function, topography), innervations, blood and lymph vessels, lymph nodes)
8(29-32)	**LOCOMOTOR APPARATUS 3 (HINDLIMB-3)**	Topographic anatomy of knee and knee region: muscles and muscle sheaths (muscles and muscle sheaths (origo, insertion, function, topography), innervation, blood vessels, lymph nodes), joints and ligaments of the hindlimb. Biomechanics of movement. Clinical anatomy of hindlimb, visual diagnostic anatomy of hindlimb, clinical aspects and topography of nerves in the hindlimb.

Teaching materials for module 3: **Video presentation:** Connecting the hindlimb 5:49 min Movement in horse 29.26 min **PowerPoint presentations:** - Elbows on the hindlimb 1 (hip and knee) 27 slides Apparatus for standing and innervations of the posterior limb, joints of 30 slides hindlimb 2 (tarsus) 29 slides, presentations of dissection: (30 slides) Anatomy of a live animal: Palpation of the posterior bone structures **CLIVE Computer interactive program (quizzes).** Anatomy of the posterior limb in dog: region of the pelvis, the thigh region, knee region. Hindlimb in cattle. Hindlimb of dog 2 (x-ray anatomy). Working with fresh, fixed and plastinated anatomy samples.		
9(33-36)	**LOCOMOTOR APPARATUS 1 axial skeleton**	**Curriculum**: Aims Lectures: Anatomy of vertebral column: bones, muscles and joints (origo, insertion, function, topography, innervations, blood vessels, lymph nodes) Clinical anatomy and visual diagnostic anatomy of the vertebral column.
10(37-40)	**LOCOMOTOR APPARATUS 2 anatomy of the thorax wall**	**Curriculum**: Aims Lectures: Anatomy of the thorax: bones, muscles, joints of the chest wall (origo, insertion, function, topography, innervations, blood vessels, lymph nodes)
11(41-44)	**LOCOMOTOR APPARATUS 3 anatomy of the abdominal wall**	Anatomy of abdominal wall: muscles of abdominal wall (origo, insertion, function, topography, innervations, blood vessels, lymph nodes)
Teaching materials for module 4 **Video presentation**: chest and abdominal wall in cow 14:48 min. **PowerPoint presentation** by dissection (30 slides) Working with fresh, fixed and plastinated anatomy samples.		
12(45-48)	**TOPOGRAPHIC ANATOMY OF HEAD AND NECK 1**	**Curriculum**: Aims Lectures: Bones of the head, Muscles of head and neck (origo, insertion, function, topography, innervations, blood vessels, lymph nodes)
13(49-52)	**TOPOGRAPHIC ANATOMY OF HEAD AND NECK 2**	**Curriculum**: Aims External nose, nasal cavity, paranasal sinuses nasofarynx, larynx, trachea (function, topography, innervations, blood vessels, lymph nodes)), oral cavity, teeth, tongue, salivary glands, gums, oesophagus (function, topography, innervations, blood vessels, lymph nodes).
14 (53- 56)	**TOPOGRAPHIC ANATOMY OF HEAD AND NECK 3**	**Curriculum**: Aims Lectures: Clinical anatomy of the head, visual diagnostic anatomy of the head. Larynx, trachea (function, topography, innervations, blood vessels, lymph nodes)) oesophagus (function, topography, innervations, blood vessels, lymph nodes)
Teaching material: the module Chapter 5 **Video presentation** of bovine 21:30 min. Neck of the ox 9:52 min. Neck of horse 7.40 min. **PowerPoint presentations**: mouth (23 slides), nasal cavity (18 slides) dentition (34 slides) Presentation for 30 dissection slides. **CLIVE Computer interactive program (quizzes)** Clinical anatomy of the nasal cavity, topographic anatomy of the dog: head (dissection), head (deep dissection), and head (sagital and transverse sections) neck. Working with fresh, fixed and plastinated anatomy samples.		
15 (57- 60)	**PRE-EXAM PERIODIC EVALUATION WEEK**	
16 (61 - 64)	**TOPOGRAPHIC ANATOMY OF A THORAX 1**	**Curriculum**: Aims Lecture: Topography of the thorax cavity. Clinical anatomy. Thorax pleura and mediastinum, anatomy of the lungs, the conducting airways including the trachea, main bronchi and bronchioles, and intrapulmonal bronchi.
17 (65-68)	**TOPOGRAPHIC ANATOMY OF A THORAX 2**	**Curriculum**: Aims Description of the anatomical structures for trachea. Pulmonary ligament, hilus of the lungs and the radix of the lungs. Describe the differences in lung anatomy among different species. Anatomy of lungs (function, topography, innervations, blood vessels, lymph nodes). Visual diagnostic anatomy of the thorax.
18 (69-72)	**TOPOGRAPHIC ANATOMY OF A THORAX 3**	**Curriculum**: Aims Lectures Heart: anatomy and functional anatomy of the heart, left and right atrium, left and right ventricle, auricles, the heart valves, pericardium, epicardium , endocardium and myocardium aorta and truncus pulmonalis, left and right coronary artery, venous blood from the heart and drainage of large veins, systemic circulation

		and pulmonary innervations of small blood, nodus subsinusus of heart. Aorta thoracica, radiography and cardiography of the heart (conduction system of heart), blood vessels, arterio-venous shunts).
Teaching material: for module 6 **Video presentation** 1.Thorax at horse 10.03 min. 2. Thorax at horse 2 17:52 min.3. Thorax at bovine's 20:44 min. 2. Thorax at ox 8.25 min. 3. Thorax at horse 3 13:25 min. Thorax at ox (heart) 15. 01 min. Presentation of 30 dissection slides. **CLIVE Computer interactive program (quizzes)** Working with fresh, fixed and plastinated anatomy samples.		
19 (73-76)	**TOPOGRAPHIC ANATOMY OF THE ABDOMEN 1**	**Curriculum**: Aims Lectures: Abdomen (general and comparative): body cavities, serous membranes, anatomy of a simple stomach (blood vessels, innervation of lymph nodes). Construction and structure of a simple stomach in dog, cardia, fundus, body, pylorus ,capacity, large and small intestines, duodenal sphincters.
20(77- 80)	**TOPOGRAPHIC ANATOMY OF THE ABDOMEN 2**	**Curriculum**: Aims Lectures: Comparative external and internal structure of a simple stomach on cat, pig and horse.. Saccus cecus and Margo plicatus the horse. Anatomy of a complex stomach (blood vessels, innervation of lymph nodes), anatomy of thin and large intestines.
21 (81-84)	**TOPOGRAPHIC ANATOMY OF THE ABDOMEN 3**	**Curriculum**: Aims Lectures: Comparative Anatomy of duodenum, jejunum and mesentery, ileum. Comparative anatomy of the colon, caecum, anus. Comparative differences in domestic animals (blood vessels, innervation of lymph nodes), anatomy and topography of the accessory glands of the digestive system (liver, pancreas) (blood vessels, innervation of lymph nodes) Clinical anatomy of the abdomen. Visual diagnostic anatomy of the abdomen.
Teaching material for module 7 **Video** Abdomen in horse 3 (topography of the abdominal organs) 8:51 min. Abdomen in horse 11:48 min. Abdomen in ox 16.10 min Abdomen horse (appendix and colon) 16:53 min. Abdominal in bovines 19:21 min. Abdomen in horse 4 (abdominal organs) 14:43 min **PowerPoint presentation**: dissection of the abdominal cavity (30 slides) **CLIVE Computer interactive program (quizzes):** abdomen of a dog - Quiz Working with fresh, fixed and plastinated anatomy samples.		
22 (85-88)	**TOPOGRAPHIC ANATOMY OF PELVIS 1**	**Curriculum**: Aims Lectures: Kidney: description of the urogenital organs and the topography of kidney, fixation of kidneys and their relation to adjacent organs structure of kidneys at mammals, blood vessels. Comparative anatomy of the kidneys of various species (cat dog sheep, horse, pig and ox), renal pelvis, calices majores, calices minores, kidney collection cyste, ureter, urinary bladder and urethra (blood vessels, innervation and lymph nodes)
23 (89-92)	**TOPOGRAPHIC ANATOMY OF PELVIS 2**	**Curriculum**: Aims Anatomy of male reproductive system: testes, accessory sex glands, penis, muscles of the male reproductive system. (blood vessels, innervation and lymph nodes) Clinical anatomy of male genital system. Visual diagnostic anatomy of male genital anatomy. Differences in the position of the testis in different species. Anatomy of the scrotum, funiculus spermaticus, accessory sex glands. Anatomy of penis in dog, cat, goat, bull, boar.
24 (93-96)	**TOPOGRAPHIC ANATOMY OF PELVIS 3**	**Curriculum**: Aims Lectures: Anatomy of female reproductive system: ovaries, tube uterine, uterus, vagina, vestibule of vagina and vulva, (blood vessels, innervations and lymph nodes). Clinical anatomy of female genital organs. Visual diagnostic anatomy of female genital organs. Terminal branches of aorta abdominalis, udder.
Teaching materials for Module 8: Video presentations: Pelvis at dog 22:25 min. Pelvis at horse (male) 23:32 min. Pelvis at ox (male) 18:38 min. Urinary system at dog 18:24 min. Pelvis at dog a 20:18 min. Pelvis at horse (female) 23:36 min. Pelvis at ox (female) 19:16 min. Udder 7.30 **CLIVE Computer interactive program (quizzes)**: Anatomy of Urinary system.		

Anatomy of the kidney: dog and cat anatomy of kidney: a sheep, horse anatomy of the kidneys, pigs, cattle. Blood vessels at kidneys in dog horse, pig and cattle. Comparative anatomy urinary bladder. Working with fresh, fixed and plastinated anatomy samples.		
25(97-100)	**THE CENTRAL NERVOUS SYSTEM**	**Curriculum**: Aims Lectures: The skull cavity, brain membranes, anatomy and blood vessels of the brain and spinal cord, cranial nerves, cerebrospinal nerves and ganglia, splanchnic nervous system: sympathetic and parasympathetic nervous system, intramural nervous system. Middle brain, Forebrain Diencefalon, Telencefalon
26 (101-104)	**THE CENTRAL NERVOUS SYSTEM**	**Curriculum**: Aims Lectures: Nuclei of cranial nerves, cranial nerves
27 (105-108)	**THE CENTRAL NERVOUS SYSTEM**	**Curriculum**: Aims Lectures: Spinal nerves, dorsal and ventral branches, cervical ventral branches, brachial plexus , lumbosacral plexus, sacral and coccidial nerves. Medulla spinalis, hypothalamus, pituitary gland.
Teaching materials for Module 9: **CLIVE Computer interactive program:** Introduction to brain - simple anatomy of brain Research the brain-anatomy: brain function **CLIVE Computer interactive program (quizzes):** Anatomy and physiology of brain **PowerPoint presentations:** Dissection of brain (30 slides) Working with fresh, fixed and plastinated anatomy samples.		
28 (109112)	**SENSORY ORGANS AND THE COMMON INTEGUMENT 1**	**Curriculum**: Aims Lectures: Anatomy of the Eye: eyeballs, orbital fascia, muscles of the eyeballs, eyelids and conjunctive, lachrymal apparatus, blood vessels and eye innervations. Anatomy of the ear: outer, middle and inner ear vestibulokohlear nerve, muscles of the ear.
29 (113-116)	**SENSORY ORGANS AND THE COMMON INTEGUMENT 2**	**Curriculum**: Aims Lectures: Skin (general and comparative): skin glands (blood vessels and innervations). Nails, claws, hooves and horns and unglues. Clinical anatomy of nails, claws, hooves and horns and unglues. Visual diagnostic anatomy of nails, claws, hooves and horns and unglues.
Teaching material for Module 10: **PowerPoint presentation:** Anatomy of the eye (46 slides) Anatomy of the ear (14 slides) **CLIVE Computer interactive program:** Normal canine retina - the eye examination with direct and indirect ophthalmoscope. Working with fresh, fixed and plastinated anatomy samples.		
30	**PRE-EXAM PERIODICAL EVALUATION WEEK**	

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unite***	
1 (1-5)	**BASIC FACTS AND CONCEPTS OF ANATOMY 1**	**Practicals:** Descriptive terms: dorsal, ventral, cranial, caudal, rostral, palmar, plantar, medial, lateral, proximal, distal, superficial, abaxial, external, internal. Planes of the body: median, sagital, transversal plane. Sections: longitudinal section, transverse section.
2 (6-10)	**BASIC FACTS AND CONCEPTS OF ANATOMY 2**	**Practicals:** General terms in osteology: condyl, epicondyl, foramen, fissure, christa, fossa, fovea, sulcus, caput, collum, processus, tuberculum. Movements: flexion-extension, rotation (supranatio, pronatio) abduction, and adduction.
Teaching material: **Video presentations:** Functional anatomy of bones 15:27 min and joints 9:15 min. **Slide presentation** for bodily planes (7 slides), **CLIVE Computer interactive program:** Under the skin of the horse - an introduction to the parts of the anatomy of the horse. Students will work independently with fresh, fixed and plastinated anatomy samples.		
3 (11-15)	**LOCOMOTOR APPARATUS 1 (FORELIMB-1)**	**Practicals:** Topographic anatomy of the thorax region: bones, muscles and muscle sheaths (origo, insertion, function, topography), innervations,

		blood vessels, lymph nodes, joints and ligaments.
4(16-20)	**LOCOMOTOR APPARATUS 2 (FORELIMB-2)**	**Practicals:** Topographic anatomy of the shoulder region: bones, muscles and muscle sheaths (origo, insertion, function, topography), innervations, blood vessels, lymph nodes, joints and ligaments.
5 (21-25)	**LOCOMOTOR APPARATUS 3 (FORELIMB-3)**	**Practicals:** Topographic anatomy of the autopodium: bones, muscles and muscle sheaths (origo, insertion, function, topography), innervations, blood vessels, lymph nodes, joints and ligaments.
Teaching material: **Slide presentation:** - Functional anatomy of the musculature of the forelimb (35 slides) joints of the forelimb 1 (23 slides), joints of the forelimb 2 (carpal joints of the fingers) (37 slides), innervations of the forelimb (20 slides), joints of the forelimb 3 (finger) (25 slides) Palpation of bony bumps on the forelimb in live animal. Presentations for dissection: (30 slides) **Video presentation**: Joints of the forelimb 8.45min. Innervations of the leg 12.12min. **CLIVE Computer interactive program (quizzes):** Anatomy of the forelimb in a dog: Forelimb dissection: forelimb a horse 1: forelimb of a horse 2, forelimb a horse 3 Topography of forelimb at horse and bovines. Forelimb in dog 1 (X-ray anatomy), Forelimb limb at cat (X-ray anatomy) Students will work independently with fresh, fixed and plastinated anatomy samples.		
6(26-30)	**LOCOMOTOR APPARATUS 1 (HINDLIMB-1)**	**Practicals:** Topographic anatomy of the hip region: bones, muscles and muscle sheaths (origo, insertion, function, topography), innervation, blood vessels, lymph nodes, joints and ligaments.
7 (31-35)	**LOCOMOTOR APPARATUS 2 (HINDLIMB-2)**	**Practicals:** Topographic anatomy of the tigh region: bones, muscles and muscle sheaths (origo, insertion, function, topography), innervation, blood vessels, lymph nodes, joints and ligaments.
8 (36-40)	**LOCOMOTOR APPARATUS 3 (HINDLIMB-3)**	**Practicals:** Topographic anatomy of the knee region: bones, muscles and muscle sheaths (origo, insertion, function, topography), innervation, blood vessels, lymph nodes, joints and ligaments.
Teaching material: **Video presentations:** Joints on the hindlimb 5:49 min. Movement horse 29.26 min **PowerPoint presentations:** - Elbows on the hindlimb 1 (hip and knee) 27 slides. Stay Apparatus and innervations of the hindlimb joints of horse (30 slides) 29 slides, Presentations of dissection: (30 slides) **CLIVE Computer interactive program (quizzes)** Anatomy of the hindlimb in a dog: region of the pelvis, the thigh region, knee region. Hindlimb in cattle. Elbows: Hindlimb in dog 2 (roentgen anatomy) Autopodium at the horse, hindlimb in cat (X-ray anatomy) Students will work independently with fresh, fixed and plastinated anatomy samples.		
9 (41-45)	**LOCOMOTOR APPARATUS 1** axial skeleton	**Practicals:** Topographic anatomy of the vertebral column: bones, muscles and muscle sheaths (origo, insertion, function, topography), innervations, blood vessels, lymph nodes, joints and ligaments.
10 (46-50)	**LOCOMOTOR APPARATUS 2** anatomy of the thorax wall	**Practicals:** Topographic anatomy of the thorax: bones, muscles and muscle sheaths (origo, insertion, function, topography), innervations, blood vessels, lymph nodes, joints and ligaments.
11 (51-55)	**LOCOMOTOR APPARATUS 3** anatomy of the abdominal wall	**Practicals:** Topographic anatomy of the abdomen wall: muscles and muscle sheaths (origo, insertion, function, topography), innervation, blood vessels, lymph nodes.
Teaching material: **Video presentation:** thorax and abdominal wall in cattle 14:48 min. Presentation by dissection (30 slides) Students will work independently with fresh, fixed and plastinated anatomy samples.		
12 (56-60)	**TOPOGRAPHIC ANATOMY OF HEAD AND NECK 1**	**Practicals:** Topographic anatomy of the head: bones, joints and ligaments of head (in general and comparative), chewing muscles, muscles of the face (origo, insertion, function, topography) innervation, blood vessels, lymph nodes.
13 (61-65)	**TOPOGRAPHIC ANATOMY OF HEAD AND NECK 2**	**Practicals:** Nasal cavity and paranasal sinuses, oral cavity and salivary glands, larynx, pharynx.
14 (66-70)	**TOPOGRAPHIC ANATOMY**	**Practicals:**

	OF HEAD AND NECK 3	Topographic anatomy of the neck: bones, joints and ligaments of head (in general and comparative), chewing muscles, muscles of the face (origo, insertion, function, topography) innervations, blood vessels, lymph nodes.
Teaching material: **Video presentation** of cattle 21:30 min. Neck of the ox 9:52 min. Neck of horse 7:40 min. **PowerPoint presentations**: mouth (23 slides) nasal cavity (18 slides), the dentition (34 slides) Presentation for 30 dissection slides **CLIVE Computer interactive program (quizzes)** Clinical anatomy of the nasal cavity, topographic anatomy of the dog: head (superficial dissection), head (deep dissection), head (sagital and transverse sections) of the neck. Students will work independently with fresh, fixed and plastinated anatomy samples.		
15 (70-75)	**PRE-EXAM PERIODICAL EVALUATION WEEK**	
16 (76-80)	**TOPOGRAPHIC ANATOMY OF A THORAX 1**	**Practicals:** Topography of the thorax cavity: pleura and mediastinum.
17 (81-85)	**TOPOGRAPHIC ANATOMY OF A THORAX 2**	**Practicals:** Anatomy of lungs. Comparative characteristics in different species.
18 (86-90)	**TOPOGRAPHIC ANATOMY OF A THORAX 3**	**Practicals:** Heart: Anatomy and functional anatomy of the heart, left and right atrium, left and right ventricle, the heart valves, pericardium, epicardium, endocardium, myocardium, aorta and truncus pulmonalis.
Teaching material: **Video presentation:** Thorax at horse 1 10.03 min. 2. Thorax at horse 2 17:52 min.3. Thorax at bovines 1 20:44 min. 2. Thorax at bovines 2 8.25 min. 3. Thorax at horse 3 13:25 min.3. Thorax at bovines 3 (heart) 15. 01 min. Slide presentations Presentation for dissection Chest basketful (30 slides) **CLIVE Computer interactive program (quizzes)** Students will work independently with fresh, fixed and plastinated anatomy samples.		
19 (91-95)	**TOPOGRAPHIC ANATOMY OF THE ABDOMEN**	**Practicals:** Abdominal cavity, serous membranes, peritoneum.
20 (96-100)	**TOPOGRAPHIC ANATOMY OF THE ABDOMEN**	**Practicals:** Anatomy of simple and compound stomach.
21 (101-105)	**TOPOGRAPHIC ANATOMY OF THE ABDOMEN**	**Practicals:** Comparative anatomy of the intestines: duodenum, jejunum, and ileum, mesentery, Comparative anatomy colon, caecum, anus. Anatomy and topography of liver, pancreas and spleen.
Teaching material: **Video presentation:** Abdomen at horse 3 (topography of the abdominal organs) 8:51 min. Abdominal at horse 11:48 min. Abdomen at ox 16.10 min Abdomen at horse (caecum and colon) 16:53 min. Abdominal at bovines 19:21 min. Horse abdomen 3 14:43 min **PowerPoint presentations:** Dissection the abdominal cavity (30 slides) **CLIVE Computer interactive program (quizzes):** abdomen at dog - Quiz Students will work independently with fresh, fixed and plastinated anatomy samples.		
22 (106-110)	**TOPOGRAPHIC ANATOMY OF A PELVIS 1**	**Practicals:** Topographic anatomy of the pelvic cavity: Anatomy and topography of the kidneys. Comparative anatomy of the kidneys of various species (cat dog sheep, horse, pig and ox). Ureter, bladder and urethra.
23 (111-115)	**TOPOGRAPHIC ANATOMY OF A PELVIS 2**	**Practicals:** Anatomy of male reproductive system: scrotum, funiculus spermaticus, testes, accessory sex glands, penis, muscles of the male reproductive system. Comparative male reproductive system anatomy in a dog, tomcat, stallion, bull, boar.
24 (116-120)	**TOPOGRAPHIC ANATOMY OF A PELVIS 3**	**Practicals:** Anatomy of female reproductive system: ovaries, tubes, uterus, vagina, vestibule of vagina and vulva; udder
Teaching materials: **Video presentations:** Pelvis at dog 22:25 min. Pelvis at horse (male) 23:32 min. Pelvis at ox (male) 18:38 min. Urinary system at dog 18:24 min. Pelvis at dog a 20:18 min. Pelvis at horse (female) 23:36 min. Pelvis at ox (female) 19:16 min. Udder 7.30 **CLIVE Computer interactive program (quizzes):** Anatomy of Urinary system. Anatomy of the kidney: dog and cat anatomy of kidney: a sheep, horse anatomy of the kidneys, pigs, cattle. Blood vessels at kidneys in dog horse, pig and cattle.		

Comparative anatomy urinary bladder. Working with fresh, fixed and plastinated anatomy samples.		
25 (121-125)	**THE CENTRAL NERVOUS SYSTEM 1**	**Practicals:** The skull cavity, brain membranes. Computer presentation of the organization of medulla spinalis CNS (middle brain, forebrain, diencefalon, telencefalon)
26 (126-130)	**THE CENTRAL NERVOUS SYSTEM 2**	**Practicals:** Nuclei of cranial nerves and cranial nerves
27 (131-135)	**THE CENTRAL NERVOUS SYSTEM 3**	**Practicals:** Spinal nerves, dorsal and ventral branches, cervical ventral branches, brachial plexus, lumbosacral plexus, sacral and coccidial nerves. Spinal cord, hypothalamus, pituitary gland.
Teaching materials: **CLIVE Computer interactive program:** Introduction to brain - simple anatomy of brain Research the brain-anatomy: brain function **CLIVE Computer interactive program (quizzes):** Anatomy and physiology of brain **PowerPoint presentations:** Dissection of brain (30 slides) Working with fresh, fixed and plastinated anatomy samples.		
28 (136-140)	**SENSORY ORGANS AND THE COMMON INTEGUMENT 1**	**Practicals:** Anatomy of the eye: eyeballs, orbital fascia, muscles of the eyeballs, eyelids and conjunctive, lachrymal apparatus, blood vessels and eye innervation. Anatomy of the ear: outer, middle and inner ear vestibulocohlear nerve, muscles of the ear.
29 (141-145)	**SENSORY ORGANS AND THE COMMON INTEGUMENT 2**	**Practicals:** Skin (general and comparative): skin glands (blood vessels and innervations). Nails, claws, hooves and horns and hoofs. Clinical anatomy of nails, claws, hooves and horns and unglues. Visual diagnostic anatomy of nails, claws, hooves and horns and unglues.
Teaching materials: **PowerPoint presentation:** Anatomy of the eye (46 slides) Anatomy of the ear (14 slides) **CLIVE Computer interactive program:** Normal canine retina - the eye examination with direct and indirect ophthalmoscope. Working with fresh, fixed and plastinated anatomy samples.		
15(146-150)	**PRE-EXAM PERIODICAL EVALUATION WEEK**	

Organization	***I Semester:*** Theory classes: 4 lessons a week (120 lessons) Practicals: 5 lessons a week (150 lessons) ***II Semester:*** Theory classes: 4 lessons a week (120 lessons) Practicals: 5 lessons a week (150 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work. Realization with working in dissection hall and processing of anatomic models.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on practicals	**12**	**15**
Written assay	**6**	**10**
Periodical evaluations	**30**	**60**
Final exam	**predicted***	
Total:	**60**	**100**

* Besides attendance on theory classes and practicals additional condition for course teacher's signature at the end of the semester, is passing of periodical evaluations during the semester with up to 25% points gained per evaluation.
* Final exam is predicted. Student who did not pass one of the periodical evaluations during the

	semester goes to final exam.
Evaluation of knowledge	**Periodical evaluation (after every finished module):** written **Final exam:** predicted **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. L Konig H.E., Liebich H.-G. Veterinary anatomy of domestic animals. Schattauer(Stuttgart - new York) textbook and Colour Atlas, 2004
2. Sisson S., The anatomy of domestic animals. W.B. Saunders Company. Philadelphia and London, 1941
3. Dyce K.M., Sack W.O., Wensing C.J.G. Textbook of veterinary naatomy. W.B. Saunders Company. Philadelphia- London-Toronto-Sydmey_Montreal-Tokyou.1996
4. Симич В., Јанкович Ж. Анатомија домачих животиња сисара - Спланцхнологиа. Ветеринарски факултет-Београд,1997
5. Evans E., de Lahunta A. Guide to the dissection of dog. W.B Saunders Company Philadelphia-London-Toronto. 1971
6. Evans E., Christensen G. Anatomy of the dog. W.B Saunders Company Philadelphia-London-Toronto. 1979
7. Nomina Anatomica Vetreinaria. Internationa committee on veterinary Gross anatomical Nomenclature, Gent, Belgium,1992
8. Петков К. Анатомија на домашните животни. Скопје 1993

Course	**CELL BIOLOGY**	**5.0 credit points**
Code	**FVM112**	
Year of study	**First (I)**	
Semester	**First (I)**	
Total teaching lessons	**60** **2+2 (30+30)**	
Course type	Compulsory	
Prerequisites	-	
Author of the course program	prof. Velimir Stojkovski, PhD	
Realized by	prof. Velimir Stojkovski, PhD ass. Igor Esmerov, MSc	
Purpose and objectives of the course program	**Theory classes**. The aim of the study of the Biology of cells is to familiarize students with introductory and basic knowledge about the basic structural and functional unit of the living organism - the cell. Students are introduced to subcellular cell structures, their construction and function. Also especially the structure and the function of the chromosome are well elaborated as an introduction to genetics. All theoretical knowledge, the students will verify through biochemical work and practicals. The Biology of the cell as a basic course helps students to gain knowledge about the structure and function of the cell. The main task of this course is to familiarize students with the structure and function of subcellular cell structures and their mutual relation in the functioning of the cell and the living organism. **Practicals**. In the course of the practical laboratory work the students will acquire basic experience in experimental work with biological materials. They will get familiar with the principles and methods of microscopy and analysis of the material. The students are obligated to develop a short project that will summarize their knowledge of the biology of the cell. The Biology of cell together with Biochemistry are basic courses which provide the basis for the study of other preclinical and clinical courses such as Microbiology, Immunology, Pharmacology, Pathophysiology, and others.	

Contents

THEORY CLASSES

No of lessons	*Teaching unit*	*Contents of teaching unit*

1	**Methods in cell biology**	Light microscopy. Cell culture. Microsurgery methods. Methods of fluorescence microscopy. Fixation of cells. Cytophotometry. Morphometry. Immunochemical reactions. Radioautography. Molecular hybridization. Electron microscopy.
2	**Evolution of the cell**	Abiogene stage. Biogene stage. Oparin theory. Cell theory
3	**Organization of the cells**	Properties of living matter. Basic features of the cell. Viruses (acellular forms of life). Bacteriophages. Reproduction of viruses. Independent overgrowth of phages. Depended overgrowth of phages. Rickettsiae. Prokariota. Mycoplasmas. Pale green algae. Bacteria. Eukariota.
4	**Chemical composition of the cell**	Inorganic compound in living organisms. Organic compounds in living organisms
5	**Eukaryotic cell and its organization**	Growth of cells. Differentiation of cells. Aging and dying cells. Necrosis. Apoptosis.
6-7	**Cell membrane**	Organization of cell membrane. Lipid bi-layer. Membrane proteins. Membrane carbohydrates. Function of cell membrane. Transport of small molecules through the membrane. Membrane transport proteins. Passive transport. Active transport. Transport of macromolecules and large particles across the cell membrane. Membrane potential (static membrane potential, polarized membrane). Changes in membrane when irritated. Differentiations of cell membrane (microvilli, intussusception). Inter cellular connections.
8-18	**Subcellular cell organization**	Endoplasmic reticulum. Ribosomes. Golgy complex. Lysosomes. Mitochondria. Peroxisomes. Cytoskeleton. Microfilaments. Microtubules. Centrioli. Eyelashes and hairline. Intermediate microfilaments. Inclusions. Nucleus.
19-27	**Genetics**	Basic principles of heredity (mono hybrid and bi hybrid intersection). Genotype and phenotype. Genes. Properties of genes. Interaction of genes (allelic interaction, un allelic interaction). Chromosomes of eukaryotes (structure, karyotype, kariogram, idiogram). Giant chromosomes. Polythene chromosomes. Brush chromosomes. Organization of DNA in chromosomes. Functional organization of chromosomes. Transmission of information in cells. Structure of genes in prokariota. Structure and expression of genes in eukariota. Regulation of gene expression in eukariota. Variability of genetic material. Crossing over. Transformation. Conyugation. Transduction. Chromosomal mutations (aberrations of chromosomes). Numerical chromosomal aberrations. Structural chromosomal aberrations (breaks, intra chromosomal aberrations, inter chromosomal aberrations). Mutations of genes. Types of mutations. Genetic basis for mutations. Induced mutations with chemical mutagens. Induced mutations with physical mutagens. Inheritance. Determination of sex and its inheritance. Genetic control of immune reactions. Immune genetics.
28-30	**Mechanisms of cell division**	Reproduction. Asexual reproduction. Sexual reproduction. Reproduction of cells. Mytosis. Amytosis. Meiosis. Regulaction of cell cycle.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unite***
1	Introduction to microscopy
2-3	Microscopy of procaryotic and eucaryotic cells
4-7	Microscopy of subcellular cell organization
8-11	Division of cell. Mitosis
11-14	Meiosis
15-16	Gametogenesis
17-20	Structure of the DNA molecule
21-26	Methods of cytogenetics and caryotype analysis
27-30	Basic principles of heredity

Organization	Theory classes: 2 lessons a week (30 lessons) Practicals: 2 lessons a week (30 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.

Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** **Passing exam criteria:** - Attendance on the teaching is not scored if student was absent on more than 20% of lessons; - Student who has gained up to 6 points from activity on Practicals is liberated from passing practical exam; - Student can pass final exam само with passed practical exam, prepared written assay and up to 42 points gained on any mode; - Student is liberated from passing final exam with passed practical exam, prepared written assay, results shown on three periodical evaluations and minimum 61 points gained on any mode .
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation: Cell, Organization of cells and subcellular cell organization Second periodical evaluation: Genetics **Final exam:** oral **Final grade mark forming criteria:**
Basic teaching aids	1. Berns, W.M. (1997): *Cells*. University of California, Irvine. 2. Митева, Н. (1998): Општа биологија. Вест, Скопје. 3. Andesirk, T, Andesirk, G. (1996): *Biology*. Life on Eart. Prentice Hall. Upper saddle River. New Jersey. 4. Gould, J., Keetan W. (1996): *Biological science*. W.W. Norton Company. New York, London. 5. Ченцов, С. Ю. (2004): *Введение в клеточную биологию*. ИКЦ Академкнига, Москва

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**6**	**10**
Attendance on practicals	**6**	**10**
Activity (knowledge) on practicals	**6**	**10**
Written assay	**6**	**10**
Periodical evaluations (two)	**18**	**30**
Final exam	**18**	**30**
Total:	**60**	**100**

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)**

Course	**BIOPHYSICS**	**5.0 credit points**
Code	**FVM113**	
Year of study	**First (I)**	
Semester	**First (I)**	
Total teaching lessons	**60** **2+2 (30+30)**	
Course type	Compulsory	
Prerequisites		
Author of the course program	prof. Nevenka Andonovska, PhD	
Realized by	prof. Suzana Topuzoski, PhD ass. Irina Petreska, MSc	
Purpose and objectives of the course program	Gaining basic knowledge of physical principles in biological processes and techniques for their investigation, also introducing of physical concepts of the modern diagnostical and therapeutic procedures in medicine. **Contents of the course program:** Basics of biomechanics. Mechanical waves. Sound. Ultrasound. Fluid biomechanics. Hemodynamics. Basics of electromagnetism. Electromagnetic waves Main principles of the geometrical optics. Eye as a optic system and eye malformations.	

<table>
<tr><td></td><td>Microscope.
Basics of atomic and nuclear physics.
X-rays and their application in medical diagnostics.
Radiation physics. Natural and artificial radioactivity.
Ionization rays, their influence on living organisms and protection.
Dosimetry.</td></tr>
<tr><td>Organization</td><td>Theory classes: 2 lessons a week (30 lessons)
Practicals: 2 lessons a week (30 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: lectures in large group
Practicals: with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar paper</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:

<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>3</td><td>4</td></tr>
<tr><td>Activity (knowledge) on practicals</td><td>12</td><td>16</td></tr>
<tr><td>Periodical evaluations (two)</td><td>40</td><td>80</td></tr>
<tr><td>Final exam</td><td colspan="2">optional</td></tr>
<tr><td>Total:</td><td>55</td><td>100</td></tr>
</table>

Condition criteria: Student has passed the exam with passing of the two periodical evaluations (realized during the semester) or with passing the final exam. In both cases student has to gain up to 50% from the maximal number of points for every periodical evaluation, i.e. up to 50% from the maximal number from the final exam.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two):
Final exam:

Final grade mark forming criteria:

<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Н. Андоновска Биофизика, Универзитет “Св.Кирил и методиј” Скопје, (1995)
2. С. Топузоски: Предавања по биофизика (интерна скрипта)
3. W. Hoope, W. Lohman, H. Markl, H. Ziegler: Biophycs, Springer-Verlag, 1983</td></tr>
</table>

Course	**CHEMISTRY**	**5.0 credit points**
Code	**FVM114**	
Year of study	**First (I)**	
Semester	**First (I)**	
Total teaching lessons	**60** **2+2 (30+30)**	
Course type	Compulsory	
Prerequisites		
Author of the course program	prof. Zehra Hajrulai-Musliu, PhD	
Realized by	prof. Zehra Hajrulai-Musliu, PhD	
Purpose and objectives of the course program	**Theory classes:** The main objective of this course is to introduce students with main principles of that matter, which is necessary for formation of a modern doctor of veterinary medicine or material which will serve as the basis of related disciplines. In general part, the student will be introduce with basic chemical concepts and laws, structure and electronic configuration of atoms, chemical bonds and chemical reactions, chemical balance, their energy change and nuclear reactions. Studying the properties of the most important chemical elements and their compounds based on general principles, electronic configuration and size of the	

	atom. In the second part of the course are presented the contemporary theory of chemical bonds in organic compounds as important mechanisms for some organic reactions. Classification of compounds as aliphatic or acyclic and cyclic. Especially will be described those groups of compounds, which the student will meet during the studies that are of particular relevance to veterinary science. In the individual groups of organic compounds, will be presented more important methods for their derivation, their physical and chemical properties, representatives and their application. The names of the compounds will be given according to IUPAC nomenclature, but also and their trivial names that are still in need. **Practicals:** Practical part aims to introduce students with the fundamentals of general, inorganic and organic chemistry, to gain knowledge about the chemical structure of substances, changes and reactions that are important for veterinary medicine (qualitative chemical analysis, quantitative analytical chemistry acidimetric, alkalimeter, iodometry, argentometry, permanganometers, and basic chemical calculation).

Contents

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1	Introduction	Role of chemistry in veterinary medicine
2-3	Structure of the substances	Elements, compounds, mixtures, structure of atoms and molecules, ionic and covalent bonds, Electro negativity of the atom and the polarization
4-6	Dispersed	Suspensions, colloid, solutions, aqueous solution hydrogen bonds, electrolyte dissociation, colloidal properties, osmosis and osmotic pressure
7-8	Acids and bases	Acids and bases, pH, buffers, biological buffers
9-10	Reactivity	Energy of reaction, energy of activation endothermal and exothermal reactions, catalysts, biological catalysts
11-12	Introduction in inorganic chemistry	Classification and distribution of elements in nature
13-15	Elements of a-subunit of the seventh, sixth, fifth, fourth and third group of the periodic system	Representation, classification, and getting their known compounds
16-20	Alkali and alkaline earth metals	Representation, classification, and getting their known compounds
21-22	Elements of B subunit - metals	Representation, classification, and getting their known compounds
23-24	Introduction to Organic Chemistry	Structure of organic molecules, functional groups, isomers and stereoisomer
25-26	Hydrocarbons	Alkanes, alkenes, alkynes, aromatic compounds
27-28	Organic compounds containing oxygen	Alcohols, ethers, phenols, aldehydes, ketones carboxylic acids and their derivatives
29-30	Organic compounds containing nitrogen	Amines, heterocyclic compounds, alkaloids

PRACTICALS

No of lessons	***Teaching unit***	***Contents of teaching unit***
1-14	Computational exercises (stehiometry)	Fundamentals of chemical computation, composition of solutions - species, concentration-calculate sizes for expressing the composition of solutions, neutralization, the dissociation constant, pH, redox equations
15-16	Volumetric analysis	Iodometry
17-20	Volumetric analysis	Acidometry
21-24	Qualitative analysis	Determination of salts, proving the cations and anions
25-28	Qualitative analysis	Determination of unknown organic samples
29-30	pH and buffers	Experimental determination of the pH of solutions and capacity buffers

Organization	Theory classes: 2 lessons a week (30 lessons) Practicals: 2 lessons a week (30 lessons)
Teaching	Theory classes: interactive (lectures in large group with discussion and active participation of the

<table>
<tr><td>methods</td><td>students).
Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:

<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>24</td><td>30</td></tr>
<tr><td>Written assay</td><td>5</td><td>10</td></tr>
<tr><td>Periodical evaluations (four)</td><td>10</td><td>20</td></tr>
<tr><td>Final exam</td><td>9</td><td>25</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
Prerequisite criteria: For being able to pass the final exam student has to gain up to 45 points from theory classes and practicals and the four periodical evaluations. If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (four): written
Evaluation of knowledge :
Practical and
theoretical exam
test

Final exam: oral
Complete final exam: oral + written (includes one periodical evaluation)
Final grade mark forming criteria:

<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Олга Бауер : Општа и неорганска Хемија: Земјоделски Факултет Скопје 2001
2. Олга Бауер : Органска Хемија: Земјоделски Факултет Скопје 2001
3. Василка Алексиќ, Благоја Јорданоски: Хемија : Универзитет „Кирил и Методиј“-Скопје 1999
4. I. Filipović, S. Lipanović: OPĆA I ANORGANSKA KEMIJA, Školska knjiga, Zagreb, 1988.
5. G. A. Taylor: ORGANSKA HEMIJA, Naučna knjiga, Beograd, 1971.
6.Dr. Milan Sikirica: Stehiometrija, Školska knjiga, Zagreb, 1989.

<u>ADDITIONAL LITERATURE</u>
1. R. T. Morrison, R. T. Boyd: ORGANSKA KEMIJA, Sveučilišna naklada Liber, Zagreb, 1979
2. M. Mladenović: ORGANSKA HEMIJA, Naučna knjiga, Beograd, 1972.
3. N. Stojanović i saradnici: ORGANSKA HEMIJA, Građevinska knjiga, Beograd, 1979.
4. P. Trpinac i sar.: OSNOVI ORGANSKE HEMIJE, Medicinska knjiga Beograd – Zagreb, 1983.</td></tr>
</table>

Course	**BIOSTATISTICS**	**2.5 credit points**
Code	**FVM115**	
Year of study	**First (I)**	
Semester	**First (I)**	
Total teaching lessons	**45 (15+30)**	
Course type	Compulsory	
Prerequisites		
Author of the course program	prof. Zhaneta Popeska, PhD	
Realized by	prof. Zhaneta Popeska, PhD	
Purpose and objectives of the course program	This course is introduction of statistical methods that are utilized for studying natural sciences. The objective of the course is to enable the students to analyze the biologic and biomedical problems in quantitative manner and thus to provide them with the basic understanding of the principles that are foundation of the statistic science. The world that we live in and which we try to understand is filled with differences and uncertainities. In the natural sciences not rarely the different experimental and observation studies produce large amount of data. The statistics provides us with methods for data organization, presentation and interpretation based on the information that they contain. The biostatistics deals with implementing these statistical methods in the fiel of natural sciences. Short description of the course: Introduction, the role of statistics in everydays life and research work. Basic terms and definitions: population, sample, and traits. Descriptive statistics: summarizing and presenting data. Tabelar and grafical presentation. Numerical methods for presenting data: measures of central tendency and variability. Probability distributions for variables: Basic discrete and continuous distributions. Inductive statistics (statistical inferences). Estimation of parameters of a population, confidence intervals for the mean value and for the dispersion. Hypothesis testing for one population. Hypothesis testing for two populations. Two-dimensional data. Linear regresion. Independence of qualitative traits. Practicals: exercises in classroom for solving statistical problems and training on PC for working with statistical software .	

Contents

THEORY CLASSES

No	***Teaching unit***	***Contents of teaching unit***
1.	INTRODUCTION TO BIOSTATISTICS	What is statistics and it's role in research work and everyday life. The main objective of every research is gathering data. The statistics is utilized to analyze these grops of data by means of summarizing, analyzing and interpretation of numerical information. Basic definitions, population and sample, different ways of sampling strategies.
2.	BASIC CONCEPTS, DEFINITIONS AND TERMS	Population, sample, variable (trait). Different types of sampling for statistical analysis. Types of data: qualitative, quantitative, discrete, continuous. Measuring scales and examples.
3.	DESCRIPTIVE STATISTICS	Description of numeric and qualitative traits. Data frequency distributions. Grafical and tabelar presentation of data. Bar, column and pie-charts, histogram. Styrges rule for constructing histograms. Cumulative frequency distribution and relative distribution.
4.	QUANTITATIVE VARIABLES	Measures of central tendency: arithmetic mean, median, mode. Measures of the shape of a distribution: range, minimum, maximum, quarters, variance and standard deviation. Examples.
5.	BASIC RULES ABOUT PROBABILITIES	Description of an experiment and random event. Compound independent events. Rules about probabilities of simple events. Counting methods, permutations, combinations and variations. Probability of random event. Expectations and variances of random variables.
6.	PROBABILITY DISTRIBUTIONS FOR DISCRETE RANDOM VARIABLES	Probability models for discrete random variables as a bridge between description of data and statistical conclusions. Distributions of discrete variables: uniform, binomial and poisson distribution. Characteristics and probabilities.
7.	PROBABILITY DISTRIBUTIONS FOR CONTINUOUS RANDOM VARIABLES	Probability distributions for interval data: uniform and exponential distribution. Characteristics of normal distribution. Area under the standard normal curve and tables for probability estimation.
8.	FUNCTIONS OF RANDOM VARIABLES AND SAMPLING DISTRIBUTIONS	Central limit theorem. Distribution of arithmetic mean of a sample. Distribution of sample variance and distribution of proportions. Sample standard error. Tables for t-distribution, chi-square distribution, F-distribution.

9.	INDUCTIVE STATISTICS- ESTIMATIONS OF PARAMETERS	Estimation of population parameters. Interval estimation of population mean. Interval estimation of population proportions. Definitions and utilization. Examples.
10.	INDUCTIVE STATISTICS- HYPOTHESIS TESTING	Hypothesis testing. Hypothesis tests of a population mean. Hypothesis test of the difference between two population means.
11.	HYPOTHESIS TESTING FOR PROPORTIONS	Hypothesis test of a population proportion. Hypothesis test of the difference between proportions from two populations.
12.	RELATIONSHIP BETWEEN QUANTITATIVE VARIABLES	Simple linear regression, correlation coefficient.
13.	ANALYSIS OF DATA VARIANCE	Analysis of variance - hypothesis testing about differences between two or more populations. ANOVA.
14.	TESTING OF QUALITATIVE DATA INDEPENDENCE	Contingency tables and Pearson's chi-square test.
15.	TIME SERIES ANALYSIS	Analysis of data through different time periods, index of increase and index of decrease.

<table>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Practicals: 2 lessons a week (30 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student's activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Besides attendance on theory classes and practicals additional condition for course teacher's signature at the end of the semester, is passing of periodical evaluations during the semester with up to 25% points gained per evaluation.
* Final exam is not predicted. Student who did not pass one of the periodical evaluations during the semester goes to one of the periodical evaluation during the exam sessions.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two): written
First periodical evaluation: general part
Second periodical evaluation: special part

Final exam: not predicted

Compete final exam: not predicted

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>Any university textbook of biostatistics.</td></tr>
</table>

Course	**HISTOLOGY WITH EMBRYOLOGY**	**7.5 credit points**
Code	**FVM116**	
Year of study	**First (I)**	
Semester	**First and second (I and II)**	
Total teaching lessons	**105 (30+75)** **I semester 1+1 (15+15)** **II semester 2+3 (30+45)**	
Course type	Compulsive course	
Prerequisites		
Author of the course program	ass. prof. Florina Popovska-Perchinik, PhD	
Realized by	ass. prof. Florina Popovska-Perchinik, PhD prof. Toni Dovenski, PhD	
Purpose and objectives of the course program	Based on previously acquired knowledge from other preclinical curricula, such as: chemistry, biophysics, cell biology, as well as parallel studied issues from molecular biology, biochemistry, anatomy and physiology, the aim of this course is to explain the microscopic structure of tissues and organs and to connect that with their formation, development and function. Therefore, this subject enables better understanding and connection to other content within the scientific area of functional morphology, but it is also a solid foundation for further studies and better understanding of the pathological changes that occur during different diseases in living organisms. The main objective of general histology with embryology is to gain knowledge about the general processes of growth, formation and cellular differentiation of the animal organism during its embryonic development (general embryology) as well as study about the microscopic structure of basic tissues (general histology). The main purpose of the special histology and embryology is to learn about the organogenesis (special embryology) and structural organization of the organs (special histology).	

Content

THEORY CLASSES

I semester

No of lessons	***Teaching unit***	***Contents of teaching unit***
I. GENERAL HISTOLOGY (9 lessons)		
1-2	**INTRODUCTION**	What is histology Laboratory techniques about slices preparation and staining
3-9	**GENERAL HISTOLOGY**	Histologic organization of the epithelia, connective tissue, cartilage, bone, muscular and nervous tissue, and blood.
II. GENERAL EMBRIOLOGY (6 lessons)		
10-12	**GENERAL EMBRYOLOGY PRINCIPLES**	Induction, determination and differentiation. Gametogenesis, meiosis, folliculogenesis, ovulation The structure of female and male gametes; Types of female gamete Gamete transport to the site of fertilization
13-15	**EARLY PHASES OF THE EMBRIOLOGYCAL DEVELOPMENT**	Cleavage of fertilized egg and types of cleavage Gastrulation, Development of axial bodies and mezoderm, Primitive body of the embryo Implantation, Fetal membranes, Placentation, Tissue development

II semester

No of lessons	***Teaching unit***	***Contents of teaching unit***
I. SPECIAL HISTOLOGY WITH EMBRYOLOGY (30 lessons)		
1	**HEAD DEVELOPMENT**	Growth of the embryonic primitive body, Development of head, neck and limbs
2-3	**HEAD**	Tonsils, Lips, Tongue, Salivary glands, Parotid gland, Teeth, Pharynx
4-5	**IMMUNE SYSTEM**	Immune system, Diffuse lymphatic tissue, Lymphatic vessels, Tonsils, Lymph node, Hemal nodes, Spleen, Thymus, Bursa Fabricii
6-7	**ENDOCRINE SYSTEM**	Development of the endocrine system, Histology of the endocrine glands: Pituitary, Thyroid, Parathyroid, Adrenal and Pineal gland

8	**THORACAL CAVITY**	Development of chest and abdominal cavity, diaphragm and epicardium
9-10	**RESPIRATORY SYSTEM**	Development of the respiratory system, Histology of the:nasal cavity, larynx, trachea, lungs
11-12	**CARDIOVASCULAR SYSTEM**	Development of the cardiovascular system, Changes in blood flow after birth, Histological appearance of the heart, Arterial and venous blood vessels, Capillaries
13-18	**DIGESTIVE SYSTEM**	Development of the digestive system, Histological appearance of the: Esophagus, Simple and compound stomach, Small and Large Intestines, Liver and Pancreas
19-21	**NERVOUS SYSTEM**	Development of the nervous system, Structural organization of CNS
22-26	**UROGENITAL SYSTEM**	Development of the urogenital system, Histological structure of the kidneys, ureter, urinary bladder, urethra, Male and Female reproductive organs
27-28	**INTEGUMENT AND SKIN DERIVATES**	Development of skin and its derivatives, Histological structure of skin, sweat and sebaceous gland, mammary gland, horns, hooves and claws
29-30	**EYE** **EAR**	Development of the eye, the construction of eyeballs, lentils, sclera, cornea, chorioidea, ciliary body, iris, retina, eye auxiliary apparatus Development of the ear. Structure of the outer, middle and inner ear.

Contents

PRACTICALS

I semester

No of lessons	***Teaching unit and contents of teaching unit***
GENERAL HISTOLOGY WITH EMBRYOLOGY (15 lessons)	
1- 2	Microscopic structure of tissues: Epithelial tissue
3-5	Microscopic structure of tissues: Connective tissue Cartilage and Bone
6-7	Microscopic structure of tissues: Muscular tissue Nervous tissue
8-10	Gametogenesis Oogenesis and folliculogenesis Maturation of female and male gametes
11-12	Fertilization Cleavage of the embryo (segmentation)
13	Early stages of embryonic development Gastrulation - types of gastrulation
14	In vitro production of embryos Aspiration and maturation of oocytes, in vitro fertilization, in vitro cultivation
15	Fetal membranes, Types of placentation, Placenta

II semester

No of lessons	***Teaching unit and contents of teaching unit***
SPECIAL HISTOLOGY WITH EMBRYOLOGY (45 lessons)	
1-3	Microscopic structure of internal organs Lips, Tongue, Salivary glands, Teeth, Tonsila pallatina
4-6	Microscopic structure of internal organs Lymph node, Spleen, Thymus
7-9	Microscopic structure of internal organs Parotid Gland, Thyroid, Adrenal and Pituitary Gland
10-12	Microscopic structure of internal organs Trachea, Lungs
13-15	Microscopic structure of internal organs

	Cardiovascular system
16-23	Microscopic structure of internal organs Esophagus, Simple and compound stomach, Small and Large Intestines, Liver and Pancreas
24-29	Microscopic structure of internal organs Testis, Epydidymis, D. Deferens, prostate, Vesicula seminalis, Ovary, Uterus, Tuba uterina
30-32	Fetal membranes, Placenta, Funiculus umbilicalis
33-35	Microscopic structure of internal organs Kidney, Ureter
36-38	Microscopic structure of internal organs Skin, mammary gland
39-41	Microscopic structure of internal organs Cerebrum, Cerebellum, Medulla spinalis
42-45	Microscopic structure of internal organs Eye, Eye lid

Organization	Theory classes: first semester 1 lesson a week (15 lessons) and second semester 2 lessons a week (30 lessons) Practicals: first semester 1 lesson a week (15 lessons) and second semester 3 lessons a week (45 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** **Prerequisite criteria:** Final exam is not predicted. Student has to pass all five periodical evaluations (to gain more than 8 points on every evaluation). This points are adding to the points gained for attendance and activity on theory classes and practicals. If the student do not pass one or more periodical evaluations (less than 8 points per evaluation), he/she has to re-pass these evaluations at the end of every semester, untill he/she gains 8 or more points. *Note*: If the student wants to prepare written assay, for this activity he/she can gain up to 5 points, which will be added on previously gained points. Written assay can be prepared only by students who have passed all five periodical evaluations**.**
Evaluation of knowledge	**Periodical evaluation (five):** written First periodical evaluation: general histology Second periodical evaluation: general embryology Third periodical evaluation: organs of head, immune and endocrine systems Fourth periodical evaluation: thoracic cavity, respiratory, cardiovascular and digestive system Fifth periodical evaluation: nervous and urogenital system, integument and skin derivates, sensory organs **Final grade mark forming criteria:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**8**	**10**
Attendance and activity (knowledge) on practicals	**12**	**15**
Written assay	**40(5x8)**	**75(5x15)**
Periodical evaluations (five)	**not predicted**	
Final exam	**60**	**100**

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. К. Поповски, Љ. Кочоски (2004): Ембриологија 2. Latshaw W.K. (1987) Veterinary Developmental anatomy 3. Sadler T. (1996) Medicinska embriologija 4. V. Pantic (1995): Histologija 5. A. Hraste (1991) Histologija domacih zivotinja 6. Kozarić, Zvonimir (1997): Veterinarska histologija, Naklada Karolina, Zagreb 7. Babić, K., A. Hraste (1997)**:** Anatomija i histologija domaćih životinja, Školska knjiga Zagreb 8. Elizabeth Aughey, Fredric L. Frye (2001): A Color Handbook of Comparative Veterinary Histology & Clinical Coorelates 9. William J. Banks (1993): Applied Veterinary Histology 10. Dellman's Textbook of Veterinary Histology (1998) ed. Joann Eurell 11. Juncueira H.C. (2005) Basic histology ***Practicums and atlases:*** 1. Љ. Кочоски (2000): Ембриологија 2. Linda M. Bacha, William J. Bacha ed.(2000): Color Atlas of Veterinary Histology 3. William J. Banks: Histology and comparative organology: a text-atlas 4. Horst-Dieter Dellmann: Veterinary histology: an outline text-atlas

Course	**BIOCHEMISTRY**	**9.0 credit points**
Code	**FVM117**	
Year of study	**First (I)**	
Semester	**Second (II)**	
Total teaching lessons	**120 (60+60)**	
Course type	Compulsory	
Prerequisites		
Author of the course program	prof. Velimir Stojkovski, PhD	
Realized by	prof. Velimir Stojkovski, PhD ass. Katerina Blagoevska, MSc	
Purpose and objectives of the course program	***Theory classes.*** Biochemistry as a science introduce the students with the basic laws of chemistry and physics, implemented in all systems of a living cell, e.g. introduction to the chemical processes in the living organisms. Students begin with the study of the structure of all bio macromolecules as basic building components of living cells, their interaction and the processes of oxidative degradation (catabolism) and biosynthesis (anabolism) and their importance in biochemistry. The study programme encompasses the transmission and expression of genetic information as an introduction to the description of nucleic acids' structure and their function in replication, transcription and translation. The regulation and interaction of the metabolic processes are covered as well. Biochemistry as a basic subject helps students in gaining knowledge for the structure and function of bio macromolecules and their interactions in physiological and patophysiological conditions. In combination with Cell biology and Genetics, it offers the basic knowledge to study other preclinical and clinical subjects such as microbiology, immunology, pharmacology, pathophysiology etc. The student's theoretical knowledge is checked up with laboratory work and practice. ***Practicals.*** During the practical laboratory work, the students get to know with the basic experiences in experimental work with biological matrix, with a special note on the safety during sampling, and protection of the analyst. Students are introduced with the basic analytical biochemical methods important in veterinary medicine (titration, kinetic methods, electrophoresis, different chromatographic techniques, spectrometry, extraction, enzyme-immunological technique, ELISA, PCR) and with laboratory instruments. Students are required to work out short project summarizing their knowledge (isolation and identification of bio macromolecules from tissues and body fluid, such as: immunoglobulin, enzymes, glycogen, lipids, nucleic acids etc). The findings are orally presented and discussed.	

Contents

THEORY CLASSES

No of lessons	*Teaching unit*	*Contents of teaching unit*
1-4	**General topics, methods and techniques in biochemistry**	What is biochemistry, it's meaning. Measuring techniques in biochemistry: colorimetry, spectrophotometry, spectrofluorimetry, dry chemistry, electrophoresis, chromatography, PCR.
5-6	**Water and electrolytes**	General physical and chemical characteristics of water. The role of the water in the organism. Transport, regulation and metabolism of water. The role and metabolism of electrolytes.
7-10	**Acid-base homeostasis**	Transport of gases and pH regulation. Carriers of oxygen transport in the organism. Hemoglobin and alsoterism: 2,3 biphosphoglycerat. Types of hemoglobin. Physical factors that influence oxygen binding and transport: temperature, pH. Carbon dioxide transport: carbaminohemoglobin, bicarbonate formation, transport, buffering, isohydric mechanism. Regulation of $[H^+]$ from CO_2: transport, isohydric mechanism. HCO_3^- distribution between plasma and erythrocytes. Realtions between hemoglobin, oxygen, carbon dioxide, hydrogen ion and 2,3 biphosphoglycerat. Plasma buffer systems, interstitial fluid of cells. Carbon dioxide – bicarbonate buffer system. Acid-base homeostasis. Compensatory mechanisms: principles of compensation. Specific compensatory processes (acidosis and alkalosis). The importance of Na^+ and Cl^- in acid-base homeostasis. Chloride shifting.
11-12	**Amino acids and peptides**	Amino acid systematics. General amino acids' characteristics. Amino acid metabolism: biosynthesis and degradation (deamination, transamination, decarboxylation). Urea cycle. Uric acid formation. Porphyrins and their metabolism.
13-16	**Proteins**	The functional role of proteins in the organism. Amino acid composition of proteins. Protein structure: primary, secondary, tertiary, quaternary. Higher/superior levels of protein organization. Other types of proteins. Protein stability. Dynamic aspects of protein structure. Methods of characterization, purification and examination of protein structure and organization. Structure and organization of protein families and super families. Protein metabolism.
17-20	**Enzymes**	Enzyme classification. Kinetics. Coenzymes: structure and function. Enzyme inhibition. Allosteric control of enzyme activity. Enzyme specificity: active point. The mechanism of catalyses. Clinical application of enzymes. Regulation of enzyme activity. Enzyme classes.
21-28	**Carbohydrates**	Carbohydrates and polysaccharides; monosaccharide, polysaccharides, glycoprotein. Carbohydrate anaerobic metabolism. Glycogenesis, glycolysis and glyconeogenesis. Metabolism of pyruvic acid. Tricarboxylic acid cycle. Energy balance from glucose oxidation by glycolysis and Crebs' cycle. Biological oxidation and oxidative phosphorylation. Pentose phosphate pathway. Metabolism of other monosaccharides. Biosynthesis of glycoside bonds. Biosynthesis of complex carbohydrates. Glycoproteins. Proteoglycans. Regulation and control of carbohydrates' metabolism.
29-34	**Lipids**	Chemical nature of lipids: fatty acids and acylglycerols. Fatty acids sources. Digestion, absorption, transport and storage of fatty acids and triacylglycerols. Fatty acids and energy production. Phospholipids, cholesterol, sfingolipides, prostaglandins, glycerophospholipids. Fatty acids metabolism: β-oxidation. Acetic bodies synthesis. Glyoxylic acid cycle.
35-38	**Metabolic interrelations**	Relations between different metabolisms in the organism.
39-42	**Nucleic acids**	DNA: structure and function. The formation of phosphodiesteric bonds in vivo. Mutation and DNA reparation. Replication, Recombination. RNA: structure and function. Synthesis. RNA polymerase. Mechanisms of transcription. Posttranscriptional processing. Translation and posttranslational modification of protein synthesis.
43-46	**Recombinant DNA and biotechnology**	Basics of recombinant DNA technology. Restriction endonucleases. DNA sequencing. Recombinant DNA and cloning. Detection and identification techniques for nucleic acids. Cloning vectors. Identification of DNA fragments. Hybridization. PCR. Expression of cloned genes in different organisms. Regulation of genes' expression.
47-50	**Hormones**	General hormone characteristics. Hormone structure (polypeptide, steroid).

		Hormone cascade system. Fedd-back mechanism of hormone activity regulation. Hormone synthesis. Metabolic inactivation and hormone degradation. Cell regulation of hormone secretion. Cyclic hormonal cascade system. Hormone-receptor interactions. Receptors' structure and function. Hormone transport in circulation.
51-56	**Molecular cell biology**	Nervous tissue: metabolism. ATP, transmembrane potential. Neuron-neuron biochemical interaction. Synthesis, deposition and release of neurotransmitters (acetylcholine, catecholamine, serotonin and neuropeptides). Eye: metabolism. Aerobic metabolism. Anaerobic metabolism. Biochemistry of the visual transduction. Muscle contraction: the role of calcium, ATP hydrolysis, actin, tropomyosin and troponin. Blood coagulation: regulation of internal pathways. Regulation of external pathways. Allosteric role of thrombin. Proteins involved in coagulation.
57-58	**Porphyrins and their metabolism**	Metabolism and intestinal iron absorption. Iron containing proteins. Molecular regulation of iron use. Distribution and kinetics. Hem biosynthesis. Catabolism..
59-60	**Vitamins, microelements, macroelements and trace elements.**	Vitamins: hydrosoluble and liposoluble. Structure and role in the organism. Hypervitaminosis, hypovitaminosis and avitaminosis. Metabolism and role of minerals in the organism.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1	Introduction to laboratory analyses
2--5	Solutions
6-9	Mineral salts
10-17	Proteins
18-25	Carbohydrates
26-29	Lipids
30-37	Enzymes
38-45	Vitamins
46-53	Hormones
54-60	Metabolism

Organization	Theory classes: 4 lessons a week (60 lessons) Practicals: 4 lessons a week (60 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**6**	**10**
Attendance on practicals	**6**	**10**
Activity (knowledge) on practicals	**6**	**10**
Written assay	**6**	**10**
Periodical evaluations (three)	**18**	**30**
Final exam	**18**	**30**
Total:	**60**	**100**

Passing exam criteria:

- Attendance on the teaching is not scored if student was absent on more than 20% of lessons;
- Student who has gained up to 6 points from activity on Practicals is liberated from passing practical exam;
- Student can pass final exam само with passed practical exam, prepared written assay and up to 42 points gained on any mode;
- Student is liberated from passing final exam with passed practical exam, prepared written assay, results shown on three periodical evaluations and minimum 61 points gained on any mode .

Evaluation of knowledge	**Periodical evaluation (three):** written *First periodical evaluation:* General topics, methods and techniques in biochemistry. Water and electrolytes. Acid-base homeostasis. Amino acids and peptides. *Second periodical evaluation:* Proteins. Enzymes. Carbohydrates. Lipids. Metabolic interrelations. *Third periodical evaluation:* Nucleic acids. Recombinant DNA and biotechnology. Hormones. Molecular cell biology. Porphyrins and their metabolism. Vitamins, microelements, macro elements and trace elements. **Final exam**: oral **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. Devlin, T. (1997): *Textbook of biochemistry with clinical correlations*, 4th ed. John Wiley & Sons inc. pub.New York 2. Stryer (1993): *Biochemistry*, 4th ed. W.H. Freeman & co. New York. 3. Lehninger, A.L., Nelson, D.L. and Cox, M.M. (2000) *Principles of Biochemistry*, 3rd ed. Worth Publishers. New York, 2000. 4. Џекова-Стојкова, С. (1999): *Биохемија.* Медицински факултет, Скопје. 5. Стојковски, В. (2001): *Ветеринарна клиничка биохемија*. Киро Дандаро, Битола. 6. Стојковски, В. (1994): *Биохемиски методи*. Елнат, Куманово.

Course	**NUTRITIOUS, HEALING AND POISONOUS PLANTS**	**3.0 credit points**
Code	**FVM118**	
Year of study	**First (I)**	
Semester	**Second (II)**	
Total teaching lessons	**45 (15 + 30)**	
Course type	Compulsory	
Prerequisites		
Author of the course program	prof. Risto Prodanov, PhD prof. Romel Velev, PhD	
Realized by	General part teachers: prof. Risto Prodanov, PhD; prof. Romel Velev, PhD Feed plants: prof. Risto Prodanov, PhD Honey pasture plants and bee pasture: prof. Misho Hristovski, PhD Healing plants: prof. Romel Velev, PhD Poisonous plants: prof. Romel Velev, PhD assistant: ass. Radmila Chrcheva-Nikolovska, MSc	
Purpose and objectives of the course program	The purpose of the course ***Nutritious, healing and poisonous plants*** to introduce students with the role and significance of vegetation for domestic animals. In the case will study the flora of view of veterinary science, i.e. students to be acquainted with the most important nutritious, healing and poisonous plants. To know plants not in botanical sequence and classification, but in their practical importance for domestic animals. **Brief curriculum - theory classes:** Introduction, relation of the course Nutritious, healing and poisonous plants with courses Nutrition of domestic animals, Pharmacology, Veterinary toxicology, Internal diseases of farm animals and Biology and pathology of bees. Flora as the main energy sources of food in nature. Chemical composition of food of herbal origin. Morphology and physiology of herbal organs. Environmental factors and flora. Taxonomy and general characteristic of plants used for animal nutrition. Production of feed on meadows, pastures and cultivated terrains. Special section: Meaning of bacteria, molds and algae; Grasses (Poaceae); Legumes (Fabaceae); Roots, tuberous and other food plants; Healing plants, Honey pasture plants and bee pasture; Toxic plants. **Practicals** Studying and recognition of sweet grasses - cereals, meadow and grasses on fields for grazing (from I, II and III class); legumes; root-tuberous other important crop for domestic animals; toxic and healing plants. The practical importance of the chemical composition of plants for domestic animals. Herbal production of animal feed. Crop production and environmental factors. Flora and bee pasture.	

Contents

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
GENERAL PART (7 lessons)		
1.	INTRODUCTION TO COURSE NUTRITIOUS, HEALING AND TOXIC PLANTS	Flora, veterinary science and husbandry: relation of the course Nutritious, healing and toxic plants with courses Nutrition of domestic animals, Pharmacology, Veterinary toxicology, Internal diseases of farm animals and Biology and pathology of bees
2.	FLORA AND ITS MEANING	Flora as a main energetical resource for food in the nature, definition of flora, vegetation, areal and taxonomy.
3.	TAXONOMY OF PLANTS	Basis of plant phylogeny.
4.	MORPHOLOGY AND PHYSIOLOGY OF PLANT ORGANS	Morphology and physiology of the vegetative and generative plant organs
5.	FLORA AND ENVIRONMENTAL FACTORS	Environmental factors and flora.
6.	MAIN FEATURES OF PLANT COMPOUNDS	Chemical compounds in the food with plant origin.
7.	CATEGORISATION AND FEATURES OF PLANTS FOR FEED; PRODUCTION OF FEED	Categorization and main features of plants used for feed. Production of feed on meadows, pastures and cultivated terrains.
SPECIAL PART (8 lessons)		
8.	FAMILY POACEAE I - GRASS I	Grasses (Poaceae). Main morphological features. Grass on pastures and meadows.
9.	FAMILY POACEAE II - GRASS II	Grass (Poaceae). Grass from cultivated terrains: corn, wheat, barley, rye, sorghum, oats, white millet...
10.	FAMILY FABACEAE – LEGUMES	Laguminas (Fabaceae). Main morphological features. Most important genus of: clover, alfalfa, vetch, soybeans, cowpea,...
11.	ROOTY, TUBERATED AND OTHER FEED PLANTS	Roots, tuberated and other nutritious plants: turnip, beet, potato, oil rapeseed, ...
12.	HONEY PASTURE PLANTS AND BEE PASTURE	Honey pasture plants and their meaning as a bee pasture. Most important honey pasture plants in a self-sown vegetation. Nectar, pollen, wax, propolis, milt.
13.	SPICY PLANTS	Spicy plants used in technology of meet and meet products.
14.	HEALING PLANTS	Important healing plants in veterinary medicine: mint, breckland thyme, camomile, marshmallow...
15.	TOXIC PLANTS	Most important toxic plants in the nature. Introduction to active substances (alkaloids, glycosides, saponins and other toxic substances found in particular plant organs.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1-2	Plane of the cell structure and cell organization types; Comparation between procariotic and eucariotic cell.
3-4	Structure of the plant cell
5-6	Taxonomy of plants
7-8	Morphology and physiology of root (Radix)
9-10	Morphology and physiology of stem (Caulis) and leaf (Folium)
11-12	Morphology and physiology of flower (Flos)

13-14	Morphology and physiology of fruit (Fructus) and seed (semen)
15-16	Features of particular grass species: I: Fam. Poaceae: first, second and third class of meadow and grazing grass.
17-18	Features of particular grass species: II: Fam. Poaceae: cultivated grasses - cereals.
19-20	Features of particular legumines species: Fam. Fabaceae: Mean features and meaning.
21-22	Features of particular species of rooty and tuberated plants
23-34	Features of particular species of honey pasture plants
25-26	Features of particular species of spicy plants
27-28	Features of particular species of healing plants - mean features and meaning.
29-30	Features of particular species of toxic plants: Alkaloid-toxic plants: main features and special studying. Glycoside and saponin toxic plants: main features and special studying. Other toxic and mechanically harmful plants: main features and special studying. Field introduction to studied plant species.

Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 2 lessons a week (30 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** * Besides attendance on theory classes and practicals additional condition for course teacher's signature at the end of the semester, is passing of periodical evaluations during the semester with up to 25% points gained per evaluation. * Final exam is not predicted. Student who did not pass one of the periodical evaluations during the semester goes to one of the periodical evaluation during the exam sessions.
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation: - general part Second periodical evaluation: - special part **Final exam:** not predicted **Complete final exam:** not predicted **Final grade mark forming criteria:**
Basic teaching aids	Данон. Ј. и Ж. Блаженчиќ, Хранливо, лековито, отровно и зачинско растение, Београд - 1989; Вучковиќ С, Крмно биље, Београд - 1999; Џукиќ Д., Биљке за производњу сточне хране, Нови Сад - 2002; Ожеговиќ Л., С. Пепељњак: Микотоксикозе, Загреб - 1995; Форенбахер С., Отровне биљке и биљна отровања животиња, Загреб - 1998.

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on practicals	**12**	**15**
Written assay	**6**	**10**
Periodical evaluations (two)	**15(x2)=30**	**30(x2)=60**
Final exam	**not predicted***	
Total:	**60**	**100**

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)**

Course	**ETHOLOGY AND ANIMAL WELFARE**	**2.0 credit points**
Code	**FVM119**	
Year of study	**First (I)**	
Semester	**Second (II)**	
Total teaching lessons	**30 (15+15)**	
Course type	Compulsory	
Prerequisites		
Author of the course program	prof. Vlatko Ilieski, PhD	
Realized by	prof. Vlatko Ilieski, PhD ass. prof. Lazo Pendovski, PhD	
Purpose and objectives of the course program	***The programs of the theory classes and practicals*** are designed in such a way to educate students of basic principles and assessments of animal's behavior and welfare for practical application. Students are expected to be trained for evaluating the animal welfare of different species within production processes, researches, zoos and other types of animal husbandry. This subject is allowing the students multidisciplinary approach to knowledge of animal behavior and its welfare. Implementation of this program involves programs of the area of functional morphology, behavior, human – animal relations, animal husbandry, animal's health and pain, assessment of welfare standards and economic implication in implementation of those standards. Students will gain basic knowledge of the animal welfare definition, morphological parameters for animal welfare and ethical and economical parameters related to animal welfare. Students will be able to check their animal welfare assessments practically with regards on the parameters related to health, feed, veterinary care, social interactions and opportunity to express their natural behavior. In the practical part of this program it will be possible to perform assessment of animal behavior through practical examples of assessing the behavior of pets, farm animals, laboratory animals and exotic animals.	

THEORY CLASSES

No of lessons	***Teaching unit and contents of teaching unit***
1	Animal welfare definition
2	Indicators for animal behavior
3	Correlation between human and animals and animal welfare
4	Morphological parameters of animal welfare
5	Physiological indicators of animal welfare
6	Production parameters in relation to animal welfare
7	Neurobiology and animal welfare
8	Pain in animals
9	Animal welfare and suffering
10	Ethical approach to animals
11	Welfare of farm animals
12	Animal welfare during slaughtering
13	Standards of animal welfare and their assessment
14	Animal welfare legislation
15	Economy and animal welfare

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1.	Animal welfare standards and their assessment
2.	Animal welfare standards and their assessment
3.	Indicators for animal behavior
4.	Assessment of animal's pain
5.	Practical assessment of behavior and welfare of pets
6.	Practical assessment of behavior and welfare of horses
7.	Practical assessment of behavior and welfare of farm animals
8.	Practical assessment of behavior and welfare of poultry
9.	Practical assessment of behavior and welfare of swine
10.	Practical assessment of behavior and welfare of laboratory animals

11.	Practical assessment of behavior and welfare of exotic animals
12.	Assessment of animal welfare during slaughtering
13.	Assessment of animal welfare during slaughtering
14.	Exam and periodical evaluation week
15.	Exam and periodical evaluation week

Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** ***Activity type*** / ***Points*** (***minimum*** / ***maximum***) **Attendance on theory classes** — **12** / **15** **Attendance and activity (knowledge) on practicals** — **12** / **15** **Written assay** — **6** / **10** **Periodical evaluations (two)** — **15(x2)=30** / **30(x2)=60** **Final exam** — **not predicted*** **Total:** — **60** / **100** * Besides attendance on theory classes and practicals additional condition for course teacher's signature at the end of the semester, is passing of periodical evaluations during the semester with up to 25% points gained per evaluation. * Final exam is not predicted. Student who did not pass one of the periodical evaluations during the semester goes to one of the periodical evaluation during the exam sessions.
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation: - general part Second periodical evaluation: - special part **Final exam:** not predicted **Complete final exam:** not predicted **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. 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	**PHYSIOLOGY OF ANIMALS**	**14.5 credit points**
Code	**FVM211**	
Year of study	**Second (II)**	
Semester	**Third and Fourth (III and IV)**	
Total teaching lessons	**195 (75+120)** **III semester 3+2 (45+30)** **IV semester 4+4 (60+60)**	
Course type	Compulsory	
Prerequisites		
Author of the	prof. Vladimir Petkov, PhD	

course program	
Realized by	prof. Vladimir Petkov, PhD
Purpose and objectives of the course program	***Theory classes:*** Basic aim of the course Physiology of animals is studying of normal functions of the cell, organs, organic systems in healthy organisms. Physiology is studying life processes and relations between internal conditions within the organism and environmental conditions. The animal physiology takes an important place in the veterinary medicine curriculum. Students which have prequalification knowledge from biology, biochemistry, anatomy, histology and embryology are learning the basic principles of the bodily functions so they can have better understanding for the clinical sciences in the veterinary medicine such as pathohistology, pathophysiology, microbiology, pharmacology, toxicology, internal medicine etc. ***Practicals:*** The practicals within this course train the students to perform basic laboratory examinations of bodily fluids (blood, urine etc), and to recognize and describe normal bodily functions on live animals.

Contents

THEORY CLASSES (III semester)

No of lessons	***Teaching unit***	***Contents of teaching unit***
1-3	Cell physiology	Functional structure of the cell Cell membrane Intercellular attachments Organelles in the cell
4-6	Blood and lymph	Blood functions General characteristics of blood Buffer systems in blood
7-9	Blood and lymph	Plasma and serum of blood Composition of the blood plasma Physiological importance of plasma proteins
10-12	Blood and lymph	Blood cells Erythrocytes Leucocytes Platelets
13-15	Blood and lymph	Blood coagulation Anticoagulation mechanisms Biological defense of the body Immunity Blood types
16-18	Blood and lymph	Pulmonary circulation Systemic circulation Physiology of the heart
19-21	Blood and lymph	Systolic and minute volume of the heart Nervous regulation of the heart
22-24	Blood and lymph	Vascular physiology Physiology of the arteries
25-27	Blood and lymph	Blood pressure Blood pressure regulation Arterial pulse
28-30	Blood and lymph	Blood distribution in organs Blood perfusion in capillaries Blood perfusion in veins
31-33	Blood and lymph	Specific blood circulation in organs Lymph and lymph circulation Reticuloendothelial system
34-36	Respiration	Breathing organs Mechanisms of breathing Types of breathing Influence of atmospheric pressure on breathing
37-39	Respiration	Pulmonary ventilation Gas exchange in lungs and tissues Gas transportation in lungs

40-42	Respiration	Centre of breathing Berating in fetuses Berating in birds Berating in fish
43-45	Regulation of body temperature	Thermoregulation

PRACTICALS (III semester)

No of lessons	***Teaching unit and contents of teaching unit***
1- 2	Orientation in the practicals, required equipment, evaluation of knowledge mode and grading
3-4	HEMATOLOGY Blood sampling Extraction of blood plasma and serum Use of anticoagulants Storing conditions of blood samples Errors due to inappropriate storing conditions of blood samples
5-6	Erythrocyte sedimentation rate (ESR) Erythrocyte osmotic resistance test
7-8	Packed cell volume (PCV) Hemoglobin concentration test Coagulation time test
9-10	Determining total blood volume Blood groups and their typisation
11-12	Evaluation in the practical approach of the acquired knowledge
13-14	Preparation of blood smear Blood cell count Differential blood cell count
15-16	Evaluation in the practical approach of the acquired knowledge
17-18	CARDIOVASCULAR PHYSIOLOGY Heart auscultation Electrocardiography (ECG)
19-20	Pulse assessment Blood pressure assessment
21-22	Evaluation in the practical approach of the acquired knowledge
23-24	RESPIRATION Altitude influence on breathing Physiological hypercapnia during sleeping and rumination
25-26	Spirometry Auscultation of lungs
27-28	Evaluation in the practical approach of the acquired knowledge
29-30	Assessing individual student activity in the practical course Student survey assessing the practical course

THEORY CLASSES (IV semester)

No of lessons	***Teaching unit***	***Contents of teaching unit***
1-4	Food digestion and nutrient absorption in carnivores, herbivores and omnivores	Digestive system Digestion in the mouth Secretion of saliva Stomach digestion Stomach digestion in monogastric animals
5-8	Food digestion and nutrient absorption in carnivores, herbivores and omnivores	Stomach digestion Regulation of gastric juice secretion Chemical phases of gastric digestion Gastric motility Nutrients order of digestion
9-12	Food digestion and nutrient absorption in carnivores, herbivores and omnivores	Characteristics of the stomach digestion in horses Abomasal digestion in ruminants Mechanical and chemical processes in the forestomachs of ruminants Micropopulation in the forestomachs Digestion in small intestine

13-16	Food digestion and nutrient absorption in carnivores, herbivores and omnivores	Digestion in large intestine Intestinal motility Digestion in birds Absorption of nutrients Absorption of water and minerals
17-20	Metabolism	Carbohydrate metabolism Lipid metabolism Protein metabolism Water metabolism Energy metabolism
21-24	Vitamins	Liposoluble vitamins Hydrosoluble vitamins Vitaminoides
25-28	Mineral metabolism	Macroelements Microelements
29-32	Physiology of secretion	Renal physiology Excretional function of kidneys Concentrational and dilutional function of kidneys Nerve and humoral control of renal function
33-36	Physiology of secretion	Endocrine function of kidneys Accumulation and extraction of urine Kidneys in birds Mammary gland
37-40	Physiology of muscles	Physiology of the skeletal muscles Types of muscle contraction Physiology of smooth muscles Nerve impulse transmission in synapses
41-44	Humoral regulation of bodily functions	Types of hormones Types of endocrine glands Hypothalamus
45-48	Humoral regulation of bodily functions	Hypothalamus Pituitary gland Epiphysis Thyroid gland
49-52	Humoral regulation of bodily functions	Adrenal glands Gonads Tissue hormones
53-56	Physiology of the nervous system	Nervous system classification Peripheral nervous system Central nervous system Somatic senses Reflexes Spinal cord Brain stem
57-60	Sense organs	The visual system Hearing and vestibular system Olfactory sensation Taste

PRACTICALS (IV semester)

No of lessons	***Teaching unit and contents of teaching unit***
1-4	PHYSIOLOGY OF DIGESTION Influence of psychological factors on salivation
5-8	Influence of meal and psychological factors on gastric secretion
9-12	Assessment of ruminal contractions in ruminants Gas accumulation in the forestomachs
13-16	Pancreatic enzymes in monitoring of normal pancreatic function Monitoring of normal liver function
17-20	Evaluation in the practical approach of the acquired knowledge
21-24	METABOLISM Carbohydrate status Lipid status

	Protein status
25-28	URINE PHYSIOLOGY Physical and chemical characteristics of urine
29-32	Microscopy of urinary sediment
33-36	Evaluation in the practical approach of the acquired knowledge
37-40	ENDOCRINOLOGY Assessing thyroxin blood concentration in dogs and cats Flight-or-fight response of epinephrine
41-44	Glucose and insulin tolerance in dogs and cats Determining the optimal time for breeding in beeches with sex hormones monitoring
45-48	NEUROPHYSIOLOGY Nerve reflexes
49-52	Neurophysiology of stress Electroencephalography (EEG) The state of sleep
53-56	Evaluation in the practical approach of the acquired knowledge
57-60	Assessing individual student activity in the practical course Student survey assessing the practical course

Organization	**Third semester** - Theory classes: 3 lessons a week (45 lessons) Practicals: 2 lessons a week (30 lessons) **Fourth semester** - Theory classes: 4 lessons a week (60 lessons) Practicals: 4 lessons a week (60 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** **Prerequisite criteria:** For being able to pass the final exam student has to gain up to 60 points from theory classes and practicals and the periodical evaluations. *If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.
Evaluation of knowledge	**Periodical evaluation:** written **Complete final exam:** oral **Final grade mark forming criteria:**
Basic teaching aids	1. Berne, M.R. and Levy, N.M.: Phisiology, sec. Ed. 1988, prevod na hrvatski. Andreas, J. and Pokrajac, N., Medicinska knjiga, Zagreb, 1993 2. Guyton, A.C.: Medicinska fiziologija. Izd. VIII, prevod, Medicinska knjiga, Beograd - Zagreb, 1985 3. Georgijevski, V.J.: Fiziologija selsko-hozjajstvenih zivotnih, Agroprom izdat, 1990 4. ohnson, R.L. editor: Physiology of the gastrointestinal tract. Vol. 1, 2. Roven press, New

Activity type	***Points***	
	minimum	***maximum***
Attendance and activity on theory classes	**12**	**15**
Attendance and activity (knowledge) on practicals	**12**	**15**
Periodical evaluations	**36**	**70**
***Final exam**		
Total:	**60**	**100**

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)**

York, 1981
5. Jovanovic, M.: Fiziologija domacih zivotinja. Medicinska knjiga, Beograd - Zagreb, 1986
6. Петков, К. Физиологија на домашните животни, Универзитет “Св. Кирил и Методиј” Скопје 2000
7. Strukii, P.: Osnovi fiziologii, prevod od angliski, Moskva, 1984
8. Swenson, M.J.: Djuksova fiziologija domacih zivotinja. Prev. od angl., Svetlost, Sarajevo, 1975
9. Tomov, T., Sedloev, N. i dr.: Veterinarnomedicinska fiziologija. Trakiski Universitet, Stara Zagora, 1998

Course	**NUTRITION OF DOMESTIC ANIMALS**	**9.0 credit points**
Code	**FVM 212**	
Year of study	**Second (II)**	
Semester	**Third and Fourth (III and IV)**	
Total teaching lessons	**120 (60+60)** **III semester 2+2 (30+30)** **IV semester 2+2 (30+30)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Risto Prodanov, PhD	
Realized by	prof. Risto Prodanov, PhD ass. Radmila Chrcheva-Nikolovska, MSs	
Purpose and objectives of the course program	***Theory classes*** from the course Nutrition of domestic animals has the goal to introduce the students with the common properties of plants and other nutritiens which are used as food for animals, their nutritional value, their directional properties, biological value etc. The study if the needs of the animals for nutritional and biological active compounds, their influence on sustaining basal physiological functions and production (production of meat, milk, eggs, wool, workforce etc.), as well as the satisfying the needs of the animal in simpler, more rational, i.e. more economical way. In order to accomplish this goals the students will be using the knowledge from other science disciplines, such as: chemistry, biochemistry, physics, physiology, microbiology, botanic, pedology, pathology, economics etc. The final goal of the science of animal nutrition is, with adequate animal nutrition, to influence of increase of the quality, qualitative and quantitative, of safe food for the humans, (meat, milk, eggs), as well as acquiring products for further industrial use (wool, skin,..) ***Practicals*** have the goals to introduce the students with: sampling techniques, analytical methods for chemical composition of food, starch equivalent, measuring units; introduction of feed; evaluation of feed hygiene; completing a meal for different species and categories of animals; analysis and correction of meals. ***Terrain practice*** - visit of feed production plant.	

Contents

THEORY CLASSES

Teaching unit	***Contents of teaching unit***
I. Nutrition of domestic animals - general part (30 lessons)	
INTRODUCTION	Subject, the role and meaning of animal food nutrition. General properties of the composition of animals and plants.
BASIC NUTRIENTS	Carbohydrates. Lipids. Proteins – amino-acids. Vitamins – categorization. Antivitamins. Minerals. Water in domestic animal nutrition. Stimulants, drugs and other compounds in feed
NUTRITIONAL VALUE OF FEED	Nutritional value of feed. Digestive value of feed. Compound balance. Energy balance, Measuring units for nutritional value of feed.
FEED	Feed. Factors of which are important for the compound and nutritional value of feed. Categorization of feed.
FEED PRESERVATION	Preservation of green feed, Hay, type of hay and nutritional value. Silage.
CEREAL FEED	Cereals. Fabaceaes.
BYPRODUCTS	Byproducts in the industry for: flour, starch, alcohol and fermentation, beer, sugar, feeding oils.
ANIMAL FEED	Feed from animals, type and feed used in domestic animals nutrition.

MINERALS	Minerals (micro elements and macro elements).
ADDITIVES	Additives in feed (Nutritional, drugs, stimulants, probiotic, prebiotic, etc.)
FEED MIXAND PREPARATION OF FEED	Type of feed mix and their purpose. Preparation of feed. Feed preservation.
ANTINUTRITIVE MATERIA	Antinutritive – harmful material in the feed (Introduction to antinutritive compounds present in the feed)
BASIC NEEDS OF ANIMALS	Animal needs for nutrients. Needs: basal metabolism, reproduction, gravid animals, milk production, growth, fattening, working animals, egg production.
II. Nutrition of domestic animals - special part (30 lessons)	
NUTRITION OF CATTLE	Specificity of nutrition of cattle. Feed choice in the nutrition of cattle. Nutrition of pregnant cows. Nutrition of cows in lactation. Composing a meal for cows in lactation. The effect of the feed on the composition and quality of the milk. Nutrition of the calves. Nutrition of older calves and heifers. Fattening of calves. Fattening of heifers. Fattening of adult cattle. Nutrition of bulls.
NUTRITION OF SHEEP AND GOATS	Choosing feed for sheep nutrition. Nutrition of gravid sheep. Nutrition of the offspring. Fattening of lambs and sheep. Goat nutrition.
NUTRITION OF PIG	Choosing feed for pig nutrition. Nutrition of pigs, pregnant pigs and lactating pigs. Nutrition of the piglets. Nutrition of breeding gilts. Nutrition of fattening pigs.
NUTRITION OF HORSE	Choosing feed for horse nutrition. Nutrition of pregnant and nursing mares. Nutrition of foals after weaning. Nutrition of yang horses and stallions. Nutrition of horses for work.
NUTRITION OF POULTRY	Choosing of feed for poultry. Nutrition of hens. Nutrition of chicks for breeding. Fattening of chicks. Nutrition of turkey.
NUTRITION OF CARNIVORES	Nutrition of dogs and cats. Specificity in the diet of carnivores.
NUTRITION OF LABORATORY ANIMALS	Specificity in the nutrition of laboratory animals.
NUTRITION OF FISH	Nutrition of carp and trout.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1. - 6.	Sampling. Determination of chemical composition of feed.
7. - 10.	Starch equivalent.
11. - 20.	Introduction of feed.
23. - 27.	Hygienic assessment of feed.
28. - 39.	Making meals for various types and categories of animals.
40. - 49.	Analysis and correction of meals.
50.- 60.	Visit of mixer for production of feed and visit of facilities in order to demonstrate the feeding of cattle, pigs and poultry.

Organization	Theory classes: 2 lessons a week (30 lessons) Practicals: 2 lessons a week (30 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance and activity on practicals	**12**	**15**
Written assay	**6**	**10**
Periodical evaluations (three)	**30**	**60**
Final exam		
Total:	**60**	**100**

	Prerequisite criteria: For being able to pass the final exam student has to gain up to 50 points from theory classes and practicals and the three periodical evaluations. If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.
Evaluation of knowledge	**Periodical evaluation (three):** written First periodical evaluation: Nutrition of domestic animals - general part Second and third periodical evaluation: Nutrition of domestic animals - special part **Final exam:** oral **Complete final exam:** oral + written (includes one periodical evaluation) **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. Проданов Р., Исхрана на домашните животни-општ дел (скрипта-материјал за интерна употреба); 2. Катерина Благоевска, Практикум за вежби (материјал за интерна употреба) 3. Каливода М., Крмива, Загреб -1990; 4. Јовановиќ Р. Исхрана домаќих животиња, Нови Сад -1993; 5. Десанка Коларски, Основи исхране домаќих животиња, Београд - 1995; 6. Радовановиќ Т. и сор., Исхрана домаќих животиња, Чачак -1997; 7. Јовановиќ Р., Исхрана домаќих животиња, Нови Сад - 2001; 8. Џукиќ Д., Биљке за производњу сточне хране, Нови Сад - 2002; 9. Јовановиќ Р., Исхрана крава, Нови Сад -1998; 10. Јовановиќ Р., Исхрана оваца, Нови Сад - 1996; 11. М. Маркевиќ, Н. Џорџевиќ. Г. Грубиќ и Ж. Јокиќ: Исхрана домакиќ животиња, Beograd-Zemun, 2004, 12. Steven leeson and John D. Summers, Commercial Poultry Nutrition –s econd edition, Ontario, 1997; 13. N. J. Daghir, Poultry production in Hot Climates, CAB International 1998; 14. Steven leeson and John D. Summers, Nutrition of the chikens, Ontario - 2001.

Course	**HUSBANDRY**	**9.0 credit points**
Code	**FVM 213**	
Year of study	**Second (II)**	
Semester	**Third and Fourth (III and IV)**	
Total teaching lessons	**120 (60+60)** **III semester 2+2 (30+30)** **IV semester 2+2 (30+30)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Mihajlo Adamov, PhD	
Realized by	prof. Mihajlo Adamov, PhD ass. Nikola Adamov, MSc	
Purpose and objectives of the course program	The ***theory classes*** of the course Husbandry are intended to make the students familiar with the theoretical basics and with the principles and methods for improving the main stock breeding areas such as cattle, sheep, goat, pig, poultry and horse production and management. Within these separate animal science areas, the students will be introduced with the most important biological, productive and reproductive features of the different types and breeds of domestic animals, the technology for their raising, their products and the measures for their improvement. In this way the future doctors of veterinary medicine will become familiar with the most important factors that determine the succesfulness of raising certain stock type which are specific to different farm animal species and thus making them capable in future to implement their knowledge in practical conditions. The objective of the ***practicals*** of the course Husbandry is to introduce the students with the principles and methods that are used for solving specific problems in animal production systems as well as with the most important breeds and types of farm animals, the purpose of their raising, their	

	exterior appearance, genotype, the different possibilities for their raising and the measures for improvement of the production. As part of this training several field trips to different animal farms are included with purpose to enable the students to better understrand the technological solutions for housing and raising different farm animal species which are the most important factors for maintaining the animal health thus making them most important factors that determine the succesfullness of every stock production system.

THEORY CLASSES

No of lessons	*Teaching unit*	*Contents of teaching unit*
Cattle production (11 lessons)		
1-2	ECONOMIC SIGNIFICANCE AND ORIGIN OF THE CATTLE	Economic importance of milk and meat production, origin and ancestors of todays cattle.
3	BOVIDAE SPECIES RELATED TO TRUE CATTLE	Biological features of watter buffalo, bison, banteng, gaur, gayal, yak and zebu cattle.
4-7	BREEDS AND GENOTYPES OF CATTLE	Breeds of cattle for milk, dual purpose and meat production.
8	CATTLE REPRODUCTION AND CALF RAISING TECHNOLOGY	Age at puberty, estrus cycle, fertilization and pregnancy, herd reproductive efficiency, reproductive features of sires, calving and newborn management.
9	MILK AND MEAT PRODUCTION	Lactation, factors that influence the milk production, dry cow management, fattening for beef production, beef production with the cow-calf system
10	POSSIBILITIES FOR CATTLE GENETIC IMPROVEMENT	Selection based on the exterior, selection based on own production performance, selection based on ancestor performance, progeny testing, marker assisted selection, quantitative trait loci (QTL's), detection of semilethal and lethal alleles.
11	CATTLE BREEDING METHODS	Maiting within the breed, different types of crossing strategies, hybridization.
Sheep production (9 lessons)		
12	ECONOMIC SIGNIFICANCE AND ORIGIN OF THE SHEEP	Economic significance of sheep milk, meat and wool production, origin of the sheep (ancestors), importance of local breeds preservation.
13-15	BREEDS OF SHEEP	Morphological and phyziological features of autochtonous breeds, breeds for milk, meat and wool production, highly fertile breeds.
16-17	SHEEP REPRODUCTION	Seasonal maiting activity, age at puberty, estrus cycle, maiting strategies, lactation, reproductive efficancy, raising newborn lambs.
18	SHEEP SELECTION AND GENETIC IMPROVEMENT	Selection based on the exterior, selection based on own production performance, selection based on ancestor performance, progeny testing, marker assisted selection, quantitative trait loci (QTL's), detection of semilethal and lethal alleles.
19	BREEDING METHODS	Maiting within the breed, different types of crossing strategies, hybridization.
20	SHEEP MILK, MEAT AND WOOL PRODUCTION	Sheep carcase quality and scoring, quality and nutritive value of lamb and sheep meat, histological and chemical composition of the sheep's wool
Goat production (10 lessons)		
21	ECONOMIC IMPORTANCE AND ORIGIN OF THE GOAT	Economic importance of goat milk, meat and hair production, goat origin (ancestors)
22-25	GOAT BREEDS	Indigenous breeds, breeds for milk production, breeds for meat production, breeds for goat hair production
26-27	GOAT REPRODUCTION	Reproductive characteristics of bucks and does, handling of pregnant does, lactation and kids raising.
28-29	GOAT SELECTION AND BREEDING	Selection based on the exterior, selection based on own production performance, selection based on ancestor performance, progeny testing, marker assisted selection, quantitative trait loci (QTL's), detection of semilethal and lethal alleles.
30	BREEDING METHODS	Maiting within the breed, crossing of different breeds, hybridization.
Pig production (10 lessons)		
31	ECONOMIC IMPORTANCE AND ORIGIN OF THE DOMESTIC PIG	Economic importance of pork production, origin and ancestors of domesticated pig
32-35	BREEDS AND TYPES OF PIGS	Primitive breeds, dual purpose breeds, modern meat breeds, chinese highly-fertile breeds

36-37	PIG REPRODUCTION	Reproductive features of gilts and boars, sexual maturity and estrus cycle, pregnancy period, farrowing and piglet raising, technological solutions for intensive farming
38	SELECTION IN PIG PRODUCTION	Selection based on the exterior, selection based on own performance, progeny testing, performans test, marker assisted selection, porcine stress sindrom (PSS)
39	PIG BREEDING METHODS	Maiting within the breed, crossmaiting of different breeds, heterosis effect
40	TECHNOLOGICAL SOLUTIONS IN FARM PIG PRODUCTION	Breeding-gestation, farrowing, nursery, grow-finishing phases of intensive swine production facilities
Poultry production (10 lessons)		
41	ECONOMIC IMPORTANCE AND ORIGIN OF POULTRY	Production of eggs and broiler meat, zoologic classification and origin of the domestic chicken, turkey goose, duck and guineafowl.
42-44	CHICKEN BREEDS AND HYBRIDS	Breeds for egg production, breeds for broiler meat production dual purpose breeds, трпезни раси, hybrids for eggs and meat.
45	TURKEY BREEDS AND HYBRIDS	Domestic turkey, bronze turkey, white dutch turkey, broadchest white turkey, beltsvile small white, black-norfolck, hybrids (American, Canadian, English).
46-47	BREEDS OF DOMESTICATED GUINEA FOWL, GEESE AND DUCKS	Domesticated guinea fowl, breeds of geese (domestic, Embden goose, Toulouse goose, Chinese goose, Italian-white, Pomeranian goose), duck breeds for eggs, duck breeds for meat, dual purpose breeds, English hybrid-Cherry Walley
48-49	CHICKEN EGG AND BROILER MEAT PRODUCTION	Facilities and equipment for raising laying hens, facilities and equipment for chicken reproduction, facilities and equipment for broiler chicken production
50	SELECTION IN POULTRY PRODUCTION	Selection based on the exterior, selection based on own performance, progeny testing, performans test, marker assisted selection.
Horse production and management (10 lessons)		
51	ORIGIN AND EVOLUTION OF THE HORSE	Origin and domestication of the horse
52-54	BREEDS OF HORSES	Equide zoological clasification, horse breeds for riding, racing, hunting and parades
55-56	EQUID SPECIES	Morphological and biological features of donkeys, semi-donkeys and zebras
57-58	EXTERIER SCORING	Temperament and exterior scoring, deformations of the legs, exterior colours and marks
59	HORSE BREEDING METHODS	Mating within pure breed, mating with crossing different breeds
60	HORSE UTILIZATION AND HOUSING	Purpose for horse raising, facilities and equipment for horse raising and management

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1-2	Economic importance and origin of the cattle
3	True cattle and their closely related species
4-7	Breeds of cattle
8	Cattle reproduction and raising newborn calves
9	Cattle milk and meat production
10	Possibilities for genetic improvement of dairy cattle
11	Cattle breeding methods
12	Economic importance and origin of the sheep
13-15	Breeds of sheep
16-17	Sheep reproduction
18	Sheep selection and breeding
19	Sheep breeding methods
20	Sheep milk, meat and wool production
21	Economic importance and origin of goats
22-25	Goat breeds
26-27	Goat reproduction
28-29	Selection methods in goat production

30	Goat breeding strategies
31	Economic importance and origin of the domestic pig
32-35	Breeds of pigs
36-37	Pig reproduction and artificial insemination
38	Selection of breeding boars and gilts
39	Pig breeding methods
40	Technological phases in intensive pig production system
41	Economic importance and origin of the poultry
42-44	Chicken breeds and hybrids
45	Domestic turkey breeds and hybrids
46-47	Domesticated guineafowl, geese and ducks
48-49	Chicken egg and broiler meat production
50	Selection in poultry production
51	Origin and evolutive stages of the domestic horse
52-54	Breeds of horses
55-56	Equid species related to the domestic horse
57-58	Horse exterior scoring
59	Horse breeding methods
60	Facilities and equipment for raising horses

<table>
<tr><td>Organization</td><td>Theory classes: 2 lessons a week
Practicals: 2 lessons a week</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity on practicals</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>5</td><td>10</td></tr>
<tr><td>First periodical evaluation</td><td>5</td><td>10</td></tr>
<tr><td>Second periodical evaluation</td><td>5</td><td>10</td></tr>
<tr><td>Third periodical evaluation</td><td>5</td><td>10</td></tr>
<tr><td>Fourth periodical evaluation</td><td>5</td><td>10</td></tr>
<tr><td>Final exam</td><td>11</td><td>20</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table></td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (four): written
First periodical evaluation: Cattle production
Second periodical evaluation: Sheep and goat production
Third periodial evaluation: Pig production
Fourth periodial evaluation: Poultry and horse production
Final exam: oral
* Besides attendance on theory classes and practicals additional condition for course teacher’s signature at the end of the semester, is passing of periodical evaluations during the semester with up to 25% points gained per evaluation.

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<tr><td>0-59</td><td>5 (Ф)</td></tr>
<tr><td>60-68</td><td>6 (Е)</td></tr>
<tr><td>69-76</td><td>7 (Д)</td></tr>
<tr><td>77-84</td><td>8 (Ц)</td></tr>
<tr><td>85-92</td><td>9 (Б)</td></tr>
<tr><td>93-100</td><td>10 (А)</td></tr>
</table></td></tr>
<tr><td></td><td></td></tr>
</table>

Basic teaching aids	1) С. Јовановиќ, Мила Савиќ, М. Вегара (2005): Сточарство (фармске животиње). Универзитет у Београду, Факултет ветеринарске медицине. 2) Н. Митиќ, Ј. Ферчеј, Д. Зеремски, Љ. Лазаревиќ (1987): Говедарство (монографско дело). Завод за уџбенике и наставна средства - Београд. 3) Т. Трајковски, Ѓ. Буневски (2006): Говедарство. Факултет за земјоделски науки и храна - Скопје. 4) М. Крајиновиќ, С. Савиќ (1992): Овчарство и козарство. Универзитет у Новом Саду, Пољопривредни факултет. 5) М. Уремовиќ, З. Уремовиќ (1997): Свињогојство. Агрономски факултет Свеучилишта у Загребу. 6) Б. Супиќ, Н. Милошевиќ, Т. Чобиќ (2000): Живинарство. Универзитет у Новом Саду, Пољопривредни факултет. 7) Н. Пејиќ (1996): Коњ (Елъуус Цабаллус). Пољопривредни факултет, Нови Сад.
Additional literature	1) Р. Лазаревиќ (2003): Савремено говедарство. Универзитет у Новом Саду, Технолошки факултет. 2) П. Цапут (1996): Говедарство. “Целебер” д.о.о. - Загреб. 3) Н. Козаровски (1998): Овчарство и козарство. Универзитет “Св. Климент Охридски”- Битола, Виша земјоделска школа. 4) М. Петровиќ (2000): Генетика и оплемењивање оваца. ИТП Научна- Београд. 5) С. Митровиќ (1996): Врсте, расе и хибриди живине. Универзитет у Београду.

Course	**ANIMAL HYGIENE**	**6.5 credit points**
Code	**FVM 214**	
Year of study	**Second (II)**	
Semester	**Third and Fourth (III and IV)**	
Total teaching lessons	**90 (60+30)** **III semester 2+2 (30+30)** **IV semester 1+1 (15+15)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Metodija Dodovski, PhD	
Realized by	prof. Cane Pejkovski, PhD	
Purpose and objectives of the course program	***Theory classes*** The main purpose of the lectures from Animal Hygiene course is gaining knowledge for environmental influence and hygienic conditions on health and production capacities of animals. The students, at this subject, will gain appropriate approach in the reducing of production, abnormal behavior and animal diseases in their complex interactions with the surroundings (environment) and also will create favorable hygienic conditions for the animals to feel comfortable and throughout their breeding and exploitation, maintaining health on highest level, with maximum possible levels of production and reproduction. Within this subject’s framework, also attention would be paid on sanitation and diseases prevention during the animal breeding process, so the future doctors of veterinary medicine would be competent for complete implementation, surveillance and control of the measures for biosecurity, disinfection, desinsection and deratization in animal’s housing facilities. ***Practicals*** Introducing students with practical aspects of animal husbandry microclimate conditions examination and assessment. Environment and animal interaction, heat balance and ventilation in the facilities. Hygienic assessment of soil, water and technical - technological standards for different domestic animal’s species. In the second part of the practical lectures particular attention would be dedicated to biosecurity measures and HACCP standards on domestic animals farms, as well as practical application of hygienic and sanitary measures (disinfection, desinsection and deratization) in animal husbandry, animal industry and diseases prevention.	

THEORY CLASSES

No of teaching lessons	***Teaching unit***	***Contents of teaching unit***
1	Development, object and practical meaning of animal hygiene in animal husbandry	History, object, categorization and methods of animal hygiene
2	Ecology basic principles	Relations among living organisms and environment
3	The significance of sunlight in animal husbandry	Sunlight properties and its effects on an organism

No of teaching lessons	*Teaching unit*	*Contents of teaching unit*
4	Hygiene of the air	Properties and additives in air; Corpuscular pollution of air; Aerogenic infections prevention; Physical characteristics of air and noise
5	Hygiene of the soil	Importance and properties of the soil; Sanitary assessment of the soil and pollution protection
6	Hydrological – pedological relations in hygiene	Hydrological – pedological relations in hygiene
7	Water supplying and water hygiene	Importance and water resources; Water properties; Hygienic assessment of water; Cleaning and improving the water quality; Watering of animals and water management in husbandry
8	Organism and environment relation	Thermoregulation in animals; Effects of temperature and moisture of air; Falls; Time, adaptation and acclimatization; Aeroions and aeroinoization in animal husbandry
9	Feed and feeding hygiene	Nutritional matters in feeds; Deficit of certain components in feed; Prevention of lack of nutritional components; Feed additives, dietetic and therapeutic feeds and feeding; Aberration of quality and feed contamination; Poisonous herbs in animal feed – Basic and Special part
10	Hygienic assessment of feeds	Voluminous, grain, powder feeds, wastes and other products in industry; animal feeds and feed rations
11	Pasture hygiene and pasturing	Pasture hygiene and pasturing
12	General hygiene and technological principles in building of husbandry facilities	Basic principles; Building facilities for domestic animals; Hygienic principles in building parts of domestic animals objects. Microclimate and interior, equipment and mechanization in domestic animals objects.
13	Housing, breeding and cattle exploitation hygiene	Bio - climatology characteristics of cattle; Housing, breeding and exploitation of dairy cows; Reproduction facilities; Facilities for housing of young herd bulls, beef cattle, bulls, calves, department for sick cows; Open lots; Cattle housing system
14	Horse housing and breeding hygiene	Horse stalls and housing; Breeding hygiene and disease prevention
15	Swine housing and breeding hygiene	Bio – ecological characteristics; Reproduction center and offspring breeding; Hog facilities; Flooring space requirements; Housing conditions, climate and ventilation; Aberration in hygiene and technological regime and swine health
16	Sheep housing and breeding hygiene	Types of housing; Bio – ecological characteristics and sheep husbandry hygiene
17	Goat housing and breeding hygiene	Bio – ecology of goats and husbandry directions; Facilities for housing, hygiene and diseases prevention
18	Poultry housing and breeding hygiene	Bio – ecological characteristics and housing systems; Housing and breeding of chickens, turkeys, geese and ducks; Incubator's hygiene and incubation
19	Rabbits breeding hygiene	Rabbits breeding hygiene
20	Milking hygiene and prevention of mammary diseases	Milking hygiene; Milking faults; Mastitis prevention; Milk with high sanitary quality
21	Hygiene in breeding of young animals	The importance of colostrum; Hygiene in breeding of young animals
22	Hygiene in working animals	Hygiene in working horses and cattle
23	Hygiene of domestic animals transport	Transport of animals by rail, truck, ship and leading; Transport of one day chicks; Preventive – technological transport measures
24	Hygiene of animal body	Skin care; Clipping; Feet and hooves care
25	Hygienic – sanitary and preventive measures in animal husbandry	Manure and urine removal and exploitation; Cleaning and removal of waste water in animal production industry and slaughter houses; Save removal and use of carcasses and wastes
26	Disinfection	Types of disinfection means and procedures; Types of

No of teaching lessons	*Teaching unit*	*Contents of teaching unit*
		disinfection according application; Disinfection of facilities, equipment, objects and materials
27	Desinsection	Types of desinsection; Methods, ways and means for eradication of insects; Common insects and pests and their eradication; Desinsection of domestic animals facilities, warehouses, depots and food industry facilities; Desinsection tools and equipment
28	Deratization	Types, methods and procedures in deratization; Eradication of different rodent species
29	Deodoration	Deodoration
30	Application of chemical compounds for DDD and environmental protection	Application of chemical compounds for DDD and environmental protection

PRACTICALS

Practical No	*Title of practical*
1	Relations between animals and environment
2	Effects and determining of physical properties of air (temperature, moisture)
3	Effects and determining of physical properties of air (air movement, pressure and noise)
4	Effects and determining of chemical content of air
5	Effects and determining of dust in the air
6	Effects and determining of microorganisms in the air
7	Types, methods and principals of ventilation
8	Ventilation for certain species of domestic animals
9	Determining of sun radiation and light in objects
10	Heat balance of domestic animals
11	Heat balance of domestic animals facilities
12	Soil influence on domestic animals and environment
13	Determining certain properties of soil (sampling, physical and chemical properties of soil)
14	Determining certain properties of water (bacteriological examination, hygienic assessment and water chlorination)
15	Water influence on domestic animals and environment
16	Practical aspects of domestic animals watering
17	Determining some water properties
18	Practical hygienic aspects for common animal species
19	Biosecurity principles
20	Biosecurity measures – practical examples
21	Disinfection – mechanism, types and stages
22	Disinfection methods
23	Applied disinfection
24	Desinsection – Common parasites and pests
25	Desinsection – types and methods
26	Integrated pest management – insects
27	Biological – morphological characteristics of rodents
28	Deratization methods
29	Integrated pest management – rodents
30	Equipment and protection during DDD

Organization	**III Semester** Theory classes: 2 lessons a week (30 lessons) Practicals: 2 lessons a week (30 lessons) **IV Semester** Theory classes: 1 lesson a week (15 lessons) Practicals: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.

Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** **Prerequisite criteria:** 1. Student has to gained up to 6 points (60%) from every periodical evaluation to gain confirmation that the such evaluation is passed and this points to be included in the course's total point score. 2. Right to go on final exam has a student who has got signature and has passed all periodical evaluations. 3. Student who during the semester has gained up to 60 points on any mode and if is satisfied with this result, he/she has right to choose to skip passing of final exam, and if he/she is not satisfied with the result, such student with the final exam can gain higher grade mark for this course.
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation (theoretical part): hygiene and ecology basics, microclimate conditions in domestic animal facilities, hygienic – technical principles in building of facilities in animal husbandry First periodical evaluation (practical part): microclimate conditions in domestic animal facilities, regulation of microclimate conditions, hygienic assessment of soil and water quality Second periodical evaluation (theoretical part): hygiene and sanitation in animal husbandry Second periodical evaluation (practical part): biosecurity and practical aspects of disinfection, desinsection and deratization **Final exam:** written or oral **Complete final exam:** written or oral (includes one or two periodical evaluations) **Final grade mark forming criteria:**
Basic teaching aids	1. Маџиров Ж.: Зоохигиена, Скопје, 1997 2. Маџиров Ж.: Дезинфекција, дезинсекција и дератизација во сточарството и ветеринарната медицина, Скопје, 1999 3. Маџиров Ж.: Практикум по зоохигиена, Скопје, 1997 4. Раденковиќ Б.: Практикум из Зоохигијене, Београд, 1998 5. Христов С.: Зоохигијена, Београд, 2002 6. Асај А.: Хигијена на Фарми у околишу, Загреб, 2003 7. Нецоб Н. и Тодор С.: Ветеринарна хигиена, Софија, 1999 8. Асај А.: Дезинфекција, Загреб, 2000 9. Асај А.: Дератизација у пракси, Загреб, 1999 10. Асај А.: Здравствена дезинсекција у настамбама и околишу, Загреб, 1999 11. Извадоци од стручна литература, интернет

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	10	12
Attendance on practicals	7	9
Activity on theory classes	0	3
Activity on practicals	2	6
Written assay	6	10
Periodical evaluations – (theoretical part) 2 (1+1)	2x6 (12)	2x10 (20)
Periodical evaluations – (practical part) 2(1+1)	2x6(12)	2x10 (20)
Final exam	11	20
Total:	**60**	**100**

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)**

Course	**MICROBIOLOGY**	**9.0 credit points**
Code	**FVM 215**	
Year of study	**Second (II)**	
Semester	**Third and Fourth (III and IV)**	
Total teaching lessons	**120 (60 + 60)** **III semester 2+2 (30+30)** **IV semester 2+2 (30+30)**	
Course type	Compulsory	
Prerequisities	-	
Authors of the course program	prof. Zdenko Markic, PhD prof. Slavcho Mrenoshki, PhD ass. Iskra Cvetkovik, MSc	
Realized by	prof. Slavcho Mrenoshki, PhD ass. Iskra Cvetkovik, MSc	
Purpose and objectives of the course program	***The theory classes*** of this course cover the basic principles of veterinary microbiology as well as the genetics from microbiological aspects. The course consists of several thematic fields. In the first one (virology and prions), studied in the third semester, the students will acquire general knowledge of the viruses as a structure, replication, interaction with the host cell, virulence etc., and will study the most important animal viruses divided by families and diseases that they cause. This part also covers the microbial genetics as well as practical application of genetic engineering. At the end, the basic principles of prion biology as well as the most important prion diseases are studied. In the second thematic field (bacteriology and mycology), studied in the fourth semester, the students will gain general knowledge of the bacteria which include structure, multiplication, nutrition and metabolism etc., as well as the most important bacteria from veterinary and zoonotic aspect and the diseases which they cause. In the second part of the lectures in this semester, the students will learn about the general properties of fungi and the most important diseases that they cause. After this course, the future Doctor of Veterinary Medicine will gain the basic knowledge of the pathogenic microorganisms, which is a necessary as a precondition for the future studies where the microbes will be studied through the diseases that they cause in domestic and wild animals. Also, with acquiring of the basics for microbe genetics and genetic engineering, students will obtain knowledge about usage of microbes in this interesting and increasingly utilized segment of the science. ***The practicals*** are also divided in two fields which arise from the previously mentioned. The laboratory practicals in the third semester are aimed to train the students with basic laboratory techniques for detection and diagnosis of viruses and prions, as well as the principles of diagnostics of the most important viral and prion diseases in particular animal species including field and laboratory aspects. The laboratory exercises in the fourth semester are aimed to train the students with basic laboratory techniques for detection and diagnosis of bacteria and fungi as, and the principles of diagnostics of the most important bacterial and fungal diseases in particular animal species including field and laboratory aspects.	

CONTENTS

L e c t u r e s

III SEMESTER		Theme	Lessons
Basic virology, genetics and genetic engineering	*1*	Structure and composition of viruses. Classification and nomenclature. Replication of viruses.	2
	2	Genetics.	2
	3	Genetic engineering.	2
	4	Genetics and evolution of viruses.	2
	5	Interaction virus-cell.	2
	6	Mechanisms of infection and viral spread in the organism. Determinants of viral virulence and resistance/ susceptibility of the host organism.	2
	7	Pathogenesis of viral diseases. Viral oncogenesis (short overview of the most important oncogenic viruses). Prevention and control of viral diseases, vaccines and antiviral drugs.	2

DNA viruses	*8*	**POXVIRIDAE**. Measels viruses. Myxoma virus. *Orf* virus (Ecthyma contagiosum). **ASFAVIRIDAE** and **IRIDOVIRIDAE**. African swine fever virus. **ADENOVIRIDAE**. Infectious canine hepatitis virus. Egg drop syndrome virus.	2
	9	**HERPESVIRIDAE**. Infectious bovine rhinotracheitis virus (IBR/IPV). Pseudorabies virus (Morbus Aujeszki). Marek's disease virus. Infectious laryngotracheitis virus. **PAPILLOMAVIRIDAE**. Bovine papilomatosis virus. **HEPADNAVIRIDAE**.	2
RNA viruses	*10*	**PARVOVIRIDAE**. Feline panleucopenia virus. Canine parvovirus. Swine parvovirus. **CIRCOVIRIDAE**. Porcine circovirus type 2. **REOVIRIDAE**. Bluetongue virus. African horse sickness virus. Rotavirus A, B, C, D and E. **BIRNAVIRIDAE**. Infectious bursal disease virus (Gumboro disease).	2
	11	**RETROVIRIDAE**. Avian leucosis virus. Feline leukemia virus and feline sarcoma virus. Bovine leucosis virus. Equine infectious anemia virus. Feline immunodeficiency virus. *Maedi/Visna* virus.	2
	12	**PARAMYXOVIRIDAE**. Bovine parainfluenza virus 3. Canine distemper virus. Peste-des-petits-ruminants virus. Newcastle disease virus. **BORNAVIRIDAE**. Borna disease virus. **FILOVIRIDAE**. **RHABDOVIRIDAE**. Rabies virus. Vesicular stomatitis virus. Viral hemorrhagic septicemia virus. Spring viremia of carp virus. **BUNYAVIRIDAE**. **ARENAVIRIDAE**.	2
	13	**ORTOMYXOVIRIDAE**. Influenza A virus (Equine influenza; Swine influenza, and Avian influenza). **CORONAVIRIDAE**. Transmissible gastroenteritis virus. Infectious bronchitis virus. **ARTERIVIRIDAE**. Equine arteritis virus. Porcine reproductive and respiratory syndrome (PRRS) virus.	2
	14	**PICORNAVIRIDAE**. Foot-and-mouth disease virus. Swine vesicular disease virus. Porcine teschovirus 1 virus. **CALICIVIRIDEA**. Swine vesicular exanthema virus. Rabbit hemorrhagic disease virus. **FLAVIVIRIDAE**. Bovine viral diarrhea virus *(BVD)* – Mucosal disease. Classical swine fever virus. **ASTROVIRIDAE**. **TOGAVIRIDAE**.	2
Prions	*15*	**VIRUSES IN BEES**. Sacbrood virus. Acute bee paralysis virus. Chronic bee paralysis virus. **PRIONS**. Definition. Cell biology. Replication cycle. **SPONGIFORM ENCEPHALOPATHIES**. *Scrapie*. Bovine spongiform encephalopathy *(BSE)*. Feline spongiform encephalopathy *(FSE)*.	2

IV SEMESTER		*Theme*	*Lessons*
Basic bacteriology	1	Morphology and classification of bacteria	2
	2	Bacterial nutrition, growth, ecology and metabolism.	2
	3	Sterilization and disinfection	2
	4	Antimicrobial chemotherapy.	2
	5	Interaction microorganism - animal. Bacterial genetics.	2
Special bacteriology	*6*	*Borrelia. Treponema. Brachyspira. Leptospira. Helicobacter.*	2
	7	*Campylobacter. Lawsonia. Bartonella. Brucella. Neisseria.*	2
	8	*Bordetella. Taylorella. Dichelobacter. Francisella. Moraxella. Pseudomonas. Burkholderia. Aeromonas.*	2
	9	*Salmonella. Proteus. Escherichia.*	2
	10	*Yersinia. Bacteroides. Fusobacterium. Pasteurella. Mannheimia. Haemophillus. Actinobacillus. Riemerella.*	2
	11	*Staphylococcus. Streptococcus. Micrococcus. Bacillus. Paenibacillus. Clostridium.*	2
	12	*Lactobacillus. Listeria. Erysipelotrix. Actynomices. Actinobaculum. Arcanobacterium. Dermatophilus. Rhodococcus. Nocardia. Corynebacterium.*	2
	13	*Mycobacterium. Mycoplasma. Rickettsialles. Coxiella. Ordo Chlamydiales.*	2
yc ol og	*14*	GENERAL MYCOLOGY. *Candida albicans. Cryptococcus neoformans. Malassezia pachydermatis.*	2

	15	Aspergillus. Penicillium. *Dermatophytes (Microsporum. Trichopyton). Coccidioides immitis/posadasii. Histoplasma capsulatum. Blastomyces dermatitidis. Sporothrix schenckii.* Mycotoxines and mycotoxicoses.	2

P r a c t i c a l s

III SEMESTER		*Theme*	*Lessons*
Basic laboratory methods in virology	*1*	Introduction in laboratory diagnosis of viruses. Laboratory biosecurity. Collection, packing and transport of samples for virology testing. Receiving of samples in the laboratory.	2
	2	Direct identification of viruses (Electron microscopes, Immunoelectron microscope).	1
	3	Direct identification of viral antigens (Immunofluorescence, Immunohistochemistry-Immunoperoxidase, ELISA, Immunodifusion).	2
	4	Direct identification of viral nucleic acid (Hybridization methods – Dot blot technique, In situ hybridization, Southern blot hybridization, PCR).	2
	5	Isolation of viruses (Cell culture, Embryonated chicken eggs, Laboratory animals).	2
	6	Quantification of viruses. Interpretation of virology laboratory results.	1
	7	Detection of viral antibodies – serological diagnosis I (processing of sera for serology, ELISA, Serum Neutralization Test, Immunoblot).	2
	8	Detection of viral antibodies – serological diagnosis II (Indirect immunofluorescence, Inhibition of Hemagglutination, Immunodifusion). Interpretation of virology laboratory results.	2
Diagnosis of viral diseases by animal species and diagnosis of prion diseases	*9*	Diagnosis of viral diseases in cattle.	2
	10	Diagnosis of viral diseases in sheep and goats.	2
	11	Diagnosis of viral diseases in pigs.	2
	12	Diagnosis of viral diseases in horses.	2
	13	Diagnosis of viral diseases in dogs and cats.	2
	14	Diagnosis of viral diseases in poultry.	2
	15	Laboratory diagnosis of prion diseases.	2

IV SEMESTER		*Theme*	*Lessons*
Basic laboratory methods in bacteriology	*1*	Introduction in laboratory diagnosis of bacteria and fungi. Laboratory biosecurity. Collection, packing and transport of samples for bacteriology testing. Acceptance of samples in the laboratory. Practical aspects of sterilization.	2
	2	Microscopy of bacteria.	2
	3	Isolation of bacteria.	2
	4	Biochemical assessment of bacteria. Biological experiment.	2
	5	Typing by antimicrobial resistance/susceptibility. Antibiotic susceptibility test.	2
	6	Practical application of serological and molecular methods in diagnosis of bacterial infections.	2
	7	Mastitis.	2

Diagnosis of bacterial and fungal diseases by animal species	*8*	Diagnosis of fungal diseases and mycotoxicoses.	2
	9	Diagnosis of bacterial and fungal diseases in cattle.	2
	10	Diagnosis of bacterial and fungal diseases in sheep and goats.	2
	11	Diagnosis of bacterial and fungal diseases in pigs.	2
	12	Diagnosis of bacterial and fungal diseases in horses.	2
	13	Diagnosis of bacterial and fungal diseases in dogs.	2
	14	Diagnosis of bacterial and fungal diseases in cats.	2
	15	Diagnosis of bacterial and fungal diseases in poultry.	2

ORGANIZATION, EVALUATION AND LITERATURE

<table>
<tr><td>Organization</td><td>Theory classes: 2 lessons a week (30 lessons per semester, total 60)
Practicals: 2 lessons a week (30 lessons per semester, total 60)
Attendance on every lecture i.e. practical takes 0.5 points.</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance on practicals</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>-</td><td>-</td></tr>
<tr><td>Periodical evaluations - lectures (4)</td><td>15</td><td>30</td></tr>
<tr><td>Periodical evaluations - practicals (4)</td><td>11</td><td>20</td></tr>
<tr><td>Final exam</td><td>10</td><td>20</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
Prerequisite criteria:
* For being able to pass the final exam student has to gain up to 51 points from theory classes and practicals and the periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluations
Total – eight, four in each semester, answered in writing
Each evaluation from THEORY CLASSES contains 30 questions and each question gives 0.25 points (maximum 7.5 points by evaluation)
Each evaluation from PRACTICALS contains 20 questions and each question gives 0.25 points (maximum 5 points by evaluation)
The questions are answered by circling the correct answer from several offered and/or by filling in the gaps in the text.
Theory classes:
First periodical evaluation - Basic virology (III semester, themes 1-7)
Second periodical evaluation - DNA viruses, RNA viruses, prions (III semester, themes 8-15)
Third periodical evaluation – Basic bacteriology and part of special bacteriology (IV semester, themes 1-8)
Fourth periodical evaluation - Part of special bacteriology and mycology (IV semester, themes 9-15)</td></tr>
</table>

Practicals:

- *First periodical evaluation* - Basic laboratory methods in virology (III semester, themes 1-8)
- *Second periodical evaluation* - Diagnosis of viral diseases by animal species and diagnosis of prion diseases (III semester, themes 9-15)
- *Third periodical evaluation* - Basic laboratory methods in bacteriology and mastitis (IV semester, themes 1-7)
- *Fourth periodical evaluation* - Diagnosis of bacterial and fungal diseases by animal species (IV semester, topics 8-15)

There is a possibility for **amendatory periodical evaluations,** which can be taken by the end of the third/fourth semester, after the regular periodical evaluations, but before the final exam. The student can choose one periodical evaluations (usually the one with the least points), but the points from the chosen evaluation (taken regular) are deleted.

Final exam: written.
The total points of the final exam are 20, which can be gained with revision of knowledge that in the final exam comprises the whole material.
In accordance with that the grading is divided in four thematic entireties and every entirety can bring maximum 5 points. The thematic entireties are
I = Basic virology, genetics, genetic engineering and prions (Theory class number from third semester: 1,2,3,4,5,6,7 and partially 15)
II = DNA and RNA viruses (Theory class number from third semester: 8, 9, 10, 11, 12, 13, 14 and partially 15);
III = Basic bacteriology and mycology (Theory class number from fourth semester:1, 2, 3, 4, 5, 14 and 15) and
IV = Special bacteriology (Theory class number from fourth semester: 6, 7, 8, 9, 10, 11, 12 and 13).
On the final exam the student gains points which are added to the previously gained points during the course, but with limitations of points by thematic entirety. For example, if on the final exam in June, the student gains 5 points from the first thematic entirety, in the next term (September), he/she cannot gain any more points from that entirety. Or if in the first final exam he/she gains 3 points in the next term, the student cannot gain more than 2 points from that entirety.

Final grade mark forming criteria:

Points	***Grade mark***
to 59,75	**5 (F)**
60,00 – 66,75	**6 (E)**
67,00 – 72,75	**7 (D)**
73,00 - 79,75	**8 (C)**
80,00 – 89,75	**9 (B)**
90,00 - 100	**10 (A)**

Basic teaching aids

1. Lectures in form of PowerPoint presentation (in electronic and/or printed form)
2. Manuals for practicals prepared by the department
3. Talaro, K. and Talaro, A. (1996). Foundations in Microbiology (2nd Ed.) Times Mirror Higher education Group, Inc.
4. Murphy, A., Gibbs, E.P.J., Horzinek, M.C. and Studdert, M.J. (1999). Veterinary virology (3rd Ed.). Academic press.
5. ICTVdB – The Universal Virus Database of the International Commitee on Taxonomy of Viruses (http://www.ncbi.nlm.nih.gov/ICTVdb/)
6. G.R. Carter, D.J. Wise and E.F. Flores (Eds.) - A Concise Review of Veterinary Virology (http://www.ivis.org/advances/Carter/toc.asp)
7. Quinn P.J., Carter, M.E., Markey, B.K. and Carter, G.R.(1994). Clinical Veterinary Microbiology. Mosby-Year Book Europe Limited.
8. Naglic, T., Hajsig, D., Madic, J. i Pinter, Lj. Veterinaska mikrobiologija, Specijalna bakteriologija i mikologija. Udzbenici sveucilista u zagrebu, 2005.

Course	**RURAL ECONOMY**	**2.0 credit points**
Code	**FVM 216**	
Year of study	**Second (II)**	
Semester	**Third (III)**	
Total teaching lessons	**30 (20+10)**	
Course type	Compulsory	
Prerequisities	-	
Author of the course program	prof. Blagica Sekovska, PhD	
Realized by	prof. Blagica Sekovska, PhD	
Purpose and objectives of the course program	***Theory classes*** The aim of this course is to introduce the students with basic principles of the rural and agriculture economy. Because of the fact that doctors of veterinary medicine with their work are closely related with economy issues, and the importance of the agriculture policy in EU, some basic knowledge from the economy is necessary. The students would be introduced with basic economic terms, as well as with basic principles of the economy, with special concerning of the rural economy, and the functioning of small agriculture companies and farms which are one of the main units of the economic activities. Also, this course has to allow to the students to realize their responsibility as a part of the national economy, and the place and role of the veterinary profession in the total economy. ***Practicals*** The practical have to obtain support to the theory classes and to provide additional elaboration of some topics from the practical aspect, via different teaching methods, as dramatization of some hypothetic situations and problem solving, making different economic analyses about the economic benefits of the company as the risk analysis, cost-benefit analysis, discussions on some topics interesting for the students etc. Practicals include also the visit of a company in rural region where some of the principles elaborated in the theory classes would be demonstrated practically.	

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1	Introduction	What is economy. Why veterinarians need knowledge of main economy issues. Basic principles of economy.
2-3	Rural economy	What is rural economy, what is the role of the economy in agriculture. Why is economy important for the veterinarians. Main terms in rural economy.
4-5	Production factors	Soil, workforce and capital, their features in the rural economy.
6-7	Agrarian policy	Basis of agrarian policy. Common agrarian policy of EU, agrarian policy measures, meaning of the agrarian policy for veterinary service.
8-9	Theory of production	Theory of agricultural production and frame product.
10-11	Production intensity	Large and small productions – advantages and lacks.
12-13	Agricultural company	Basis and nature of the company. Features of the agricultural company.
14-15	Characteristics and development of the rural economy in Republic of Macedonia	Land capacities, organizational structure, types of mechanization, workforce and other features important for the veterinarians.
16-17	Role of the rural economy in national economy	Production of food, production of raw materials, contribution in forming of national income.
18-19	Agricultural products market	Market mechanism, supply and demand analysis. Basis and classification of the market.
20	Rural economy as a factor of the sustained development	Development of rural economy. Basis of sustainability. Contribution of the rural economy in the total national economy.

PRACTICALS

No of lessons	***Teaching unit***	***Contents of teaching unit***
1	Rural economy	Case study
2	Production factors	Examples and practicals supported with graphics.

3	Drop income theory	Practicals for explanation of one of the more important theories in the rural economy.
4-5	Agrarian policy	Case study and comparative analysis of EU and Republic of Macedonia.
6	Visit of farm or other agriculture company	Practical explanation of the main part of the theory classes about company.
7	Economic evaluation of the company's gain	Economy, productivity, rentability and economical efficiency.
8	Rural economy regulatory instruments obtained by the government	National income, aggregate demand, unemployment, inflation, fiscal and monetary policy
9	Risk analysis and cost-benefit analysis	Practicals with main analyses of company's gain.
10	Management of a farm	Elaboration of the main principles of farm managing.

Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures with discussion and active participation of the students). Practicals: practicals with dramatization of situation, case study, presentation of some teaching units by the students, discussion about topics of interest and other ways of work in smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** * Besides attendance on theory classes and practicals additional condition for course teacher's signature at the end of the semester, is passing of periodical evaluations during the semester with up to 25% points gained per evaluation. * Final exam is predicted on written request of the student if he/she want to gain grade mark higher than one which was gained with his/her previous activities. Student who did not pass one of the periodical evaluations during the semester goes to one of the periodical evaluation during the exam sessions.
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation: - general part Second periodical evaluation: - special part **Final exam:** not predicted **Complete final exam:** optional **Final grade mark forming criteria:**
Basic teaching aids	1. Доц. д-р Благица Сековска: Авторизирани предавања за Рурална економија, Realized byни во периодот од 2006 до денес на FVM-C 2. Доналд Д. Кеј и други: Менаџмент на фарма, ТРИ, Скопје, 2009 3. Тодор Тодоров: Економија, економика, Organization, Скопје, 2001 4. Јосип Деффилипис: Економика полјопривреде, Загреб, 2002 5. Слободан Цераниќ: Планирање у агробизнису, Београд, 2007 5. Благица Сековска: Маркетинг менаџмент на анимални производи, Скопје 2008

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**10**	**12**
Attendance and activity (knowledge) on practicals	**10**	**14**
Written assay	**10**	**14**
Periodical evaluations (two)	**15(x2)=30**	**30(x2)=60**
Final exam	**optional**	
Total:	**60**	**100**

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)**

Course	**IMMUNOLOGY**	**2.0 credit points**
Code	**FVM 217**	
Year of study	**Second (II)**	
Semester	**Third (III)**	
Total teaching lessons	**30 (20 + 10)**	
Course type	Compulsory	
Prerequisities	-	
Authors of the course program	prof. Zdenko Markic, PhD prof. Slavcho Mrenoshki, PhD ass. Iskra Cvetkovik, MSc	
Realized by	prof. Slavcho Mrenoshki, PhD ass. Iskra Cvetkovik, MSc	
Purpose and objectives of the course program	***Theory classes.*** This course is about the main principles and mechanisms included in the immune system in animals and humans. The features of the immune response would be elaborated on the structural and functional aspects of the immune system. Special attention is given on mechanisms involved in the innate and acquired i.e. humoral and cellular immune response within the reaction of the organism on the infection with pathogenic microorganisms. Also, subject of this course are both the principles of vaccination, transplantation, tumor immunology, as well as immunopathology, which includes hypersensitivity reactions, autoimmune diseases and immunodefficiencies. ***Practicals*** included in this course have aim to introduce student with the main immunological techniques for detection and diagnosis of the infectious diseases.	

Contents

THEORY CLASSES

No	*Theme*	*Lessons*
1	Three lines of defense. Participants in the immune response. Main features of the immune response. Immune system – development and structure. Blood and blood elements.	2
2	Organs and tissues of the immune system. Lymphocytes and immune system duality. Antigens.	2
3	Antibodies.	2
4	T lymphocytes. Histocompatibility antigens. Mother-fetus relationship during gravidity. Immunotholerance. Control of the immune response.	2
5	Complement. Serological reactions. Innate immunity.	2
6	Acquired immunity.	2
7	Immunity against bacterial infections. Immunity against viral infections. Immunity against fungal infections. Immunity against parasite invasions. Tumor immunology.	2
8	Hypersensitivity (allergy).	2
9	Transplantation immunology. Autoimmunity.	2
10	Immunodeficiency. Immunomodulation.	2

PRACTICALS

No	*Theme*	*Lessons*
1	Introduction in serological reactions. Radioimmunoassays.	1
2	Immunofluorescency assays.	1
3	Enzyme-linked immunoassays.	1
4	Precipitation. Antibody titration.	1
5	Agglutination.	1
6	Virus hemagglutination and inhibition of hemagglutination.	1
7	Complement-fixation test.	1
8	Assays performed in live systems (neutralization and preventive assays).	1
9	Cellular immune response detection tests.	1
10	Diagnostic application of the immunoassays.	1

Organization	Theory classes: 2 lessons a week (20 lessons)

	Practicals: 2 lessons a week (10 lessons) *Attendance on every lesson takes 1 point.*
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** **Prerequisite criteria:** For being able to pass the final exam student has to gain up to 51 points from theory classes and practicals and the periodical evaluations.
Evaluation of knowledge	**Periodical evaluation (four):** written **Theory classes**: • *First periodical evaluation* – Themes nos. 1-5 • *Second periodical evaluation* – Themes nos. 6-10 **Practicals**: • *First periodical evaluation* – Themes nos. 1-5 • *Second periodical evaluation* – Themes nos. 6-10 There is a possibility for **amendatory periodical evaluations**, which can be taken by the end of the third/fourth semester, after the regular periodical evaluations, but before the final exam. The student can choose one periodical evaluations (usually the one with the least points), but the points from the choosen evaluation (taken regular) are deleted. **Final exam:** Written. The total points of the final exam are 20, which can be gained with revision of knowledge that in the final exam comprises the whole material. In accordance with that the grading is divided in three thematic entireties and every entirety can bring maximum these points: - Thematic entirety I = 7 points (theory classes nos. 1, 2, 3, and 4) - Thematic entirety II = 7 points (theory classes nos. 5, 6 and 7) - Thematic entirety III = 6 points (theory classes nos. 8, 9 and 10) On the final exam the student gains points which are added to the previously gained points during the course, but with limitations of poems by thematic entirety. For example, if on the final exam in June, the student gains 7 points from the first thematic entirety, in the next term (September), he/she cannot gain any more points from that entirety. Or if in the first final exam he/she gains 3 points in the next term, the student cannot gain more than 4 points from that entirety. **Final grade mark forming criteria:**
Basic teaching aids	1. Lectures in form of PowerPoint presentation (in electronic and/or printed form) 2. Manual for practicals prepared by the department 3. Naglic, T. i Hajsig, D. Veterinarska imunologija. Skolska knjiga, Zagreb, 1993. 4. Talaro, K. and Talaro, A. Foundations in microbiology (2nd Ed.). Times Mirror Higher education Group, Inc., 1996. 5. Tizard, I.R., Veterinary Immunology, An Introduction (Fifth Edition). W.B. Saunders

Activity type	Points	
	minimum	**maximum**
Attendance on theory classes	16	**20**
Attendance on practicals	8	**10**
Written assay	-	**-**
Periodical evaluations - lectures (two)	15	**30**
Periodical evaluations - practicals (two)	11	**20**
Final exam	10	**20**
Total:	60	**100**

Points	Grade mark
to 59,5	**5 (F)**
60,0 – 66,5	**6 (E)**
67,0 – 72,5	**7 (D)**
73,0 - 79,5	**8 (C)**
80,0 – 89,5	**9 (B)**
90,5 - 100	**10 (A)**

	Company, 1996.

Course	**PATHOPHYSIOLOGY**	**9.5 credit points**
Code	**FVM 311**	
Year of study	**Third (III)**	
Semester	**Fifth and Sixth (V and VI)**	
Total teaching lessons	**120 (60+60)** **V semester 2+2 (30+30)** **VI semester 2+2 (30+30)**	
Course type	Compulsory	
Prerequisities		
Authors of the course program	prof. Igor Ulchar, PhD ass. Irena Celeska, MSc	
Realized by	prof. Igor Ulchar, PhD ass. Irena Celeska, MSc	
Purpose and objectives of the course program	**Theory classes** Pathophisiology is upgrade of the knowledge acquired with the preclinical courses such as: Chemistry, Biophysics, Cell biology, Biochemistry, Anatomy of animals, Histology with embryology, Nutrition of domestic animals, Physiology of animals, Microbiology and Immunology at it is parallel with such courses as Pathology, Pharmacology, Veterinary toxicology and Parasitology and parasitic diseases. The aim of pathophisiology are the mechanisms and ways of pathology processes (pathogenesis), so the students are introduced in clinical courses which are very important for gaining over veterinary medicine faculty. *Short curriculum:* Introduction to pathophysiology and etiologic factors. Disorders of cell. Pathophisiology of the blood and blood elements (red blood cells, white blood cells, platelets, hemostasis). Disorder of individual organic systems (heart and blood vessels; metabolism; gastrointestinal system, liver and exocrine pancreas; respiratory system; urinary system; endocrine system; immunology system; thermoregulation; neuromusculatory system; locomotory system). Reaction of the organism caused by pathological process (biological mediators, stress-syndrome, inflammation, shock). Pathophisiology of malignant processes. Congenital anomalies in domestic animals. **Practicals** The subject of practicals are laboratory methods for determination the changes in pathophisiology processes (clinical pathology): hematology disorders, metabolic disorders, disorder in cardiovascular, intestinal and respiratory systems, clinical enzymatology, tests for determination of hepatocelular disorders, exocrine pancreas, renal failure, urinalysis, endocrinology tests, metabolic profile tests, tumors immunology, blood group typing, basic principles of veterinary cytology.	

THEORY CLASSES

V Semester

No of lessons	***Teaching unit***	***Contents of teaching unit***
1.	Introduction to pathophysiology. Etiologic factors	Introduction to pathophysiology. Relation between health and disease. Ethological factors: congenital (genetic), physical, chemical, biological.
2.	Disorders of cell.	Disorders in cell membrane. Structural and functional mitochondrial disorders. Functional lysosomal disorders. Cell integral reaction in injury. Cell death.
3.-4.	Pathophisiology of blood	Disorders in plasma volume. Blood physic-chemical disorders. Blood composition disorders. Disorders of blood protein.
5.-6.	Disorders in red blood cells function.	Anemias. Polycytemias.
7.-8.	Disorders in white blood cells function.	Morphological and functional disorder in individual type of white blood cells. White blood cells disorders, complete cell count and individual type of white blood cells. Leukemias.
9.-10.	Haemostatic disorders.	Coagulation disorders (coagulopathies). Functional platelet disorders. Qualitative platelet disorders.
11.-13.	Disorders in heart function	Disorders in heart conductive system (nomotopic, heterotopic, disorders in impulse conduction). Myocardial disorders (pressure and volume overload, hypertrophy of heart, circulatory failure, cardiomyopathies). Endocardial disorders. Pericardial disorders.

14.	Disorders in blood vessels.	Hemodynamic in arterial pressure. Systemic arterial hypertension. Aneurisms. Atherosclerosis.
15.-21.	Metabolic disorders.	Metabolic disorders in farm animals: production diseases; nutrition deficiencies, (energy, proteins, minerals, vitamins). Metabolic disorders in dogs and cats: Polyphagia with weight loss; Obesity; hyper and hypoglycemia; diabetes mellitus; diabetic ketoacidosis; hyperlipidemia; electrolytic disorders.
23.-26.	Disorders in gastrointestinal system.	Clinical manifestation in gastrointestinal disorders. Disorder in taking food. Chewing disorder. Swelling disorder. Esophagus obstruction. Colic syndrome in horses. Gastric dilatation in horses. Gastric (gastro duodenal) ulcers in foals. Intestine obstruction in horses. Intestine meteorismus in horses. Arteriris verminosa mesentricus (trombomebolic colic). Obstruction of bowl intestine in horses. Gastritis/abomasitis. Gastric ulcers. Enteritis (with malabsorption, entheropathy and diarrhea). Nutrition diarrhea. Indigestion of proventricles. Rumen overloading. Rumen meteorismus. Reticuloperitonitis traumatica and consequent diseases. Left dislocation of abomasum. Peritonitis.
27.-30.	Disorders in function of liver and exocrine pancreas	**Disorders in liver function:** Hepatic insufficiency. Jaundice (icterus). Disorders in carbohydrate metabolism. Disorders in protein metabolism in hepatic insufficiency. Hepatitis. **Disorders in function of exocrine pancreas:** Acute pancreatitis. Exocrine pancreas failure

VI Semester

31.-34.	Disorders in respiratory system	Pulmonal volumes and capacities. Airways protective mechanisms. Alveolar ventilation. Disorders in alveolar ventilation. Diseases of lungs (obstructive, restrictive). Disorders in respiratory rhythm and irregular respiration. Impact of the oxygen partial pressure in the inspired air. Respiratory problems in neonates.
35.-39.	Disorders in urinary system	Glomerular renal diseases (glomerulopathies): glomerulonephritis, amyloidosis. Tubular and interstitial renal diseases: tubulointerstitial nephritis, pyelonephritis. Renal oedema. Renal insufficiency (acute, chronical). Disorders in urine volume and contents. Disorders in function of lower urinary tract.
40.-42.	Endocrine disorders	Introduction. Relation between endocrine and nervous system. Hypothalamus and hypophiseal functional disorders. Parathyroid disorders. Thyroid disorders. Endocrine pancreas disorders. Suprarenal disorders.
43.46.	Endogenous biological active substances in pathophisiological processes	Biogenic amines. Plasmakinin system. Complement. Prostaglandins and leucotrienes. Renin-angiotensine system. Growth factors. Cytokines, lymphokines and monokines. Gastrointestinal hormones and neuropeptides. Atrial natriuretic peptide. Endothelin and nitrogen monoxide.
47.-48.	Syndrome of general adaptation (Stress-syndrome). Inflammation.	Syndrome of general adaptation: organism reactivity; Somatic changes in stress; Effectors systems in stress response; Disorders in regulation systems in stress response. Inflammation: Acute inflammation; Chronical inflammation.
49.-50.	Shock (collapse). Pathophisiology of pain.	Shock: main disorders in circulatory shock; pathogenesis of collapse conditions; Pathophisiological basis of circulatory collapse; Effect of circulatory collapse on organism level; Manifestation of circulatory collapse in individual organs. Pathophisiology of pain: pain receptors and pain causes; Control in pain sense; neuropathic pain.
51.-52.	Disorders of the immune system	Hypersensitive reaction. Autoimmune diseases. Primary immune deficiency.
53.	Disorders of thermoregulation	Maintenance of thermoregulatory homeostasis. Hyperthermia. Hypothermia.
54.-55.	Neuromusculatory disorders.	Principles of neuromusculatory disorders. Manifestations of neurological disease. Diffuse disease of brain. Disease of meanings. Toxical and metabolic encephalopathy. Psychosis and neurosis. Epilepsy. Diseases of spinal cord. Myopathy. Myositis.
56.	Disorders of bones and joints.	Osteodistrophia. Osteomyelitis. Arthropathy. Arthritis and synovitis.
57.-58.	Pathophisiology of malignant processes.	Carcinogenesis. Ethiopathogenic factors of cell malignant transformation. Malignant cells. Relation between tumor and organism.
59.-60.	Congenital anomalies in domestic animals.	Disease caused by chromosomal abnormalities. Congenital metabolic disease. Congenital defects of digestive, circulatory and musculoskeletal

		system.

PRACTICALS

V Semester

No of lessons	*Teaching unit and contents of teaching unit*
1.	Definition and basically principles of veterinary clinical pathology. Factors which have impact on laboratory result: Biological and analytical factors (pre instrumental, instrumental, post instrumental).
2.	Clinical application of tests results. Reference values. Measurement units. Test validation.
3.	Blood sampling, equipment of blood sampling, anticoagulants.
4.	Laboratory instruments and equipment.
5.-6.	Electrolytes and acid base balance: composition of body fluids, abnormalities of serum concentration of sodium, potassium and chlorides; determination of acid base balance.
7.-8.	Hematological tests – hemogram; packed cell volume and total proteins; red blood cells count, hemoglobin, white blood cells differential count, platelet count, morphology and MPV; histograms, estimation of blood smears.
9.	Red blood cell disorder: polycythemia (erythrocytosis) and types of anemia.
10.-11.	White blood cells: type of white blood cells – function and interpretation of white blood cells blood changes.
12.-13.	Hemostasis: normal hemostasis, clinical signs of hemostatic disorder, sampling and keeping.
14.	Bone marrow – sampling and interpretation: indication and contraindication, sampling, estimation of cell lines; erythropoiesis, megacariopoiesis, myelopoiesis.
15.-18.	Cardiovascular disorder and irregular distribution of body fluids.
19.	Glucoses: physiological features and measurement; abnormalities.
20.	Lipids: physiological features and measurement; abnormalities. Ketone bodies: types and increasing reason.
21.	Proteins: physiological features. Measurement: serum proteins and electrophoresis; abnormalities in serum protein concentration. Fibrinogen.
22.	Minerals: macroelements and oligoelements
23.-26.	Gastrointestinal disorders. Ruminal microflora examination.
27.	Clinical enzymatology, liver enzymes, hepatogram.
28.-29.	Liver. Tests for determination of hepatocelullar injury, cholestasis and liver disfunction.
30.	Disorders of exocrine pancreas.

VI Semester

31.-34.	Respiratory disorders.
35.-36.	Clinical examination of renal function.
37.-39.	Urinalysis, physical characteristic of urine, physic-chemical characteristic, chemical characteristic, determination of glucosuria, proteinuria, examination of organize and non organize urine sediment.
40.-42.	Endocrinological tests: thyroid hormones, corticosteroids; other hormones: parathyroid, insulin, growth hormone.
43.-44.	Metabolic profile tests.
45.-46.	Immunology of tumors.
47.-48.	Inflammation.
49.-50.	Shock.
51.-52.	Blood types and transfusiology: systems of blood types, typisation of blood types and cross reactions; definition, indications for transfusiology.
53.	Immune disorders.
54.	Muscle: tests for myocytic injury and myocytic activity.
55.	Neurological disorders
56.	Introduction in clinical cytology: samples; sample handling, advantages and limitations, characteristic of benign lesions, (inflammation, hematoma, lypoma, cysts, syalocele).
57.	Cytology of tissue mass and organs. Analysis of body fluids: transudate, modified transudate, exudates, neoplastic effusions, other (hemoperitoneum, uroperitoneum, chilus)
58.	Cytology of neoplastic masses: benign neoplasm; cytological criteria of malignancy. Lymph node cytology.
59.	Cytology of cerebrospinal fluid (CSF), synovial fluids and effusions.
60.	Sampling procedures.

Organization	Theory classes: V semester 2 lessons a week (30 lessons) and VI semester 2 lessons a week (30 lessons) = Total 60 lessons Practicals: V semester 2 lessons a week (30 lessons) and VI semester 2 lessons a week (30 lessons) = Total 60 lessons

<table>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.
Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>8</td><td>10</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>8</td><td>10</td></tr>
<tr><td>Written assay</td><td>0</td><td>5</td></tr>
<tr><td>Periodical evaluation 1</td><td>5</td><td>10</td></tr>
<tr><td>Periodical evaluation 2</td><td>5</td><td>10</td></tr>
<tr><td>Periodical evaluation 3</td><td>5</td><td>10</td></tr>
<tr><td>Periodical evaluation 4</td><td>5</td><td>10</td></tr>
<tr><td>Practical test</td><td>10</td><td>15</td></tr>
<tr><td>Final exam</td><td>10</td><td>20</td></tr>
<tr><td>Total:</td><td>56</td><td>100</td></tr>
</table>
If the student does not gain 5 points on some of the periodical evaluations, it is considered that such evaluation is not passed, and student has ability to pass one reparative periodical evaluation at the end of the semester. For being able to go to final exam student has to gain up to 51 points from the theory classes and practicals and the four periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (four): written
First periodical evaluation: lessons nos. 1-10
Second periodical evaluation: lessons nos. 11-30
Third periodical evaluation: lessons nos. 31-50
Fourth periodical evaluation: lessons nos. 51-60

Final exam: whole material
Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Патолошка физиологија - предавања (авторизирана скрипта), доц. д-р Игор Улчар, 2008;
2. Патолошка физиологија - практикум (авторизирана скрипта), помл. ас. Ирена Целеска, 2008;
3. Патолошка физиологија на цицачи и птици, проф. д-р Јосиф Тосевски, 2005;
4. Енциклопедиски речник по патофизиологија, проф. д-р Јосиф Тосевски, ас. д-р Игор Улчар, 2005;</td></tr>
</table>

Course	**PHARMACOLOGY**	**11 credit points**
Code	**FVM 312**	
Year of study	**Third (III)**	
Semester	**Fifth and Sixth (V and VI)**	
Total teaching lessons	**135 (75+60)** **V semester 2+2 (30+30)** **VI semester 3+2 (45+30)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Romel Velev, PhD	
Realized by	prof. Romel Velev, PhD	
Purpose and objectives of the course program	***Theory classes*** of course Pharmacology aim to introduce students with the structure, mode of action and pharmacokinetics of the individual groups of veterinary drugs; scientific basis for their safe and efficient use; ethical, environmental implications and implications on human health from	

	use of veterinary medicines for the student to be able to demonstrate their knowledge and understanding of pharmacology as a basis for the study and practice of clinical veterinary medicine. In this way the future doctor of veterinary medicine will be allowed to acquire: knowledge to identify the indications for medical intervention; ability to select the most appropriate drug (or drugs) indicated for a particular disease or pathological condition, ability to use the drug at optimal dose and prescribed dosage regimen, the ability to provide advice and application of appropriate treatment in individual life or group of animals, ability to give advice on preventive veterinary medicine, including promoting optimal health and production. ***Practicals*** of the course Pharmacology aim to introduce students with correct prescribing, dispensing, safe storage and safe removal of drugs, to acquaint students with various pharmaceutical forms of drugs and their characteristics; to introduce future doctors of veterinary Medicine for the sources of data on licensed drugs and illustrates some abstract theoretical concepts through simple laboratory experiments.

THEORY CLASSES

V Semester

No of lessons	***Teaching unit***	***Contents of teaching unit***
I. GENERAL PHARMACOLOGY (18 lessons)		
1- 2	INTRODUCTION TO THE COURSE	Historic development of pharmacology. Definition, range and subject of studying of pharmacology.
3-4	ORIGIN OF DRUGS AND DEFINIOTION OF DRUG	Origin and nature of drugs. Definition of drug and poison. Contemporary discovering of new drugs. Registration of veterinary drugs in Republic of Macedonia.
5-6	PHARMOACOTHERAPY, DOSES AND DRUG DOSING	Pharmacotherapy and types of pharmacotherapy. Doses, drug dosing and factors that impact on dose.
7-12	PHARMACOKYNETICS	Drug transport through the cell membranes.
		Administration and absorption of drugs. Distribution of drug.
		Elimination of drugs: biotransformation (metabolism) of drugs, excretion of drugs.
13-16	PHARMACODINAMICS	Main features and definition of pharmocodinamics. Receptors (macromulecular structure, regulation, drug-receptor interaction)
		Categorization of receptors: membrane receptors (ionotropic, G-protein and enzyme receptors) and intracellular receptors. Drugs which act through receptors.
17-18	REACTIONS BETWEEN DRUGS AND DRUG SIDE EFFECTS	Reactions between drugs. Side and toxic effects of drugs.
II. SPECIAL PHARMACOLOGY (12 lessons)		
19 - 24	PHARMOACOLOGY OF CNS (CNS depressors and stimulators, psychotropic drugs)	Main features of structure and function of CNS. General CNS depressors (general anesthetics, sedatives)
		Selective CNS depressors (antiepipileptics, analgesics, antipyretic analgesics, NSAIDs).
		CNS stimulators (cortical and medullar stimulators). Psychotropic drugs (neuroleptics, benzodiazepines, α_2-agonists).
25-26	PHARMACOLOGY OF PNS	Local anesthetics. Relaxant drugs.
27-30	PHARMACOLOGY OF ANS	Adrenergic drugs, β-adrenolytics and adrenergic neuron blocators.
		Cholinergic and anticholinergic drugs. Gangliar blocators.

VI Semester

II. SPECIAL PHARMACOLOGY (45 lessons)		
1-3	PHARMACOLOGY OF THE DIGESTIVE TRACT	digestives, antacids, emetics, antiemetics, carminatives, antizimotics, laxant drugs, antidiarrhoeics, drugs with effect on liver
4-6	PHARMACOLOGY OF THE RESPIRATORY SYSTEM	analeptics, expectoranses, antitusics, bronchodilatators, nasal decongestives
7-9	PHARMACOLOGY OF THE GENITAL AND URINARY SYSTEM	diuretics, antidiuretic drugs, urinary antiseptics and other drugs impacting on genital system in females and males

10-12	PHARMACOLOGY OF THE CARDIOVASCULAR SYSTEM AND BLOOD	drug for treatment of heart failure, antiarrythmic drugs, antihypertensive and other anticoagulant drugs, platelet aggregation inhibitors, antianemic drugs, water and electrolytes
13-15	PHARMACOLOGY OF HORMONES	pituitary hormones, gonad hormones, corticosteroids, thyroid hormones etc.
	PHARMACOLOGY OF SKIN AND MUCOSES	sedation means, irritant means
	PHARMACOLOGY OF VITAMINS AND MINERALS	hydrosoluble vitamins, liposoluble vitamins, minerals
CHEMOTHERAPY OF THE MICROBIAL DISEASES (ANTIMICROBIAL DRUGS)		
16-18	INTRODUCTION	Chemotherapeutics. Mechanism of action of the antimicrobial drugs; Interactions, indications for use and risks related with use of antimicrobial drugs; Bacterial resistance; General principles of the anti-infective therapy.
	BETA LACTAMIC ANTIBIOTICS (Penam penicillins)	Chemical structure and categorization; Penicillins with narrow spectrum; Penicillins with extended spectrum (amino benzyl penicillins); Penicillins active against enterobacteria; Antipseudomonal penicillins; Penicillins resistant on β-lactamases.
19-21	BETA LACTAMIC ANTIBIOTICS (cephalosporins)	Chemical structure and categorization; antibacterial spectrum; dosage and mode of use; therapeutical indications; resistance; side effects; Beta-lactamase inhibitors; Carbapenems; Monobactams; Tribactams
22-24	AMINOGLICOZYDES AND AMINOCYCLITOLS	Chemical structure and categorization; antibacterial spectrum; dosage and mode of use; therapeutical indications; resistance; side effects;
	TETRACYCLINES	
	AMPHENICOLS	
25-27	MACROLYDES, AZILYDES, LINCOZAMIDES, PLEUROMUTILINS	Chemical structure and categorization; antibacterial spectrum; dosage and mode of use; therapeutical indications; resistance; side effects;
	PEPTIDE ANTIBIOTICS	Polymixines, glycopeptides, streptogramines, bacytracine
	OTHER ANTIBIOTICS	Ionophore antibiotics, novobiocine, riphamicine, fuzidine acid, izoniazyde, mupirocine, metenamin)
28-30	SYNTHETIC ANTIMICROBIAL SUBSTANCES	Sulphonamides, diaminopyrimidines and their combinations
		Chynolons
		Nitrofurans, nitroimidazoles, quinosaline derivates
31-33	ANTIMYCOTIC DRUGS	Chemical structure and categorization; mechanism of activity; antimycotic spectrum; dosage and mode of use; therapeutical indications; resistance; side effects;
	ANTIVIRAL DRUGS	specificy of viral replication; locus and mechanism of activity; antiviral spectrum; dosage and mode of use; therapeutical indications; resistance; side effects;
34-36	ANTISEPTICS AND DESINFITIENTS	Introduction and definition; mechanism of action, classification. Halogens and their compounds; superficial active substances, oxidative and reductive means, acids and bases, alcohols, phenols and phenol derivates, heavy metals and their salts, antiseptic pigments
CHEMOTHERAPY OF MALIGNANCIES (ANTINEOPLASTIC DRUGS)		
37-39	ANTINEOPLASTIC DRUGS	Cytostatics: chemical structure and categorization; dosage and mode of use; therapeutical indications; resistance; side effects;
	IMMUNOPHARMACOLOGY	Vaccines and sera, immunomodulators (immunosupresives and immunostimulators)
CHEMOTHERAPY OF PARASITIC DISEASES (ANTIPARASITIC DRUGS)		
40-42	ECTOANTIPARASITICS	Chemical structure and categorization; mechanism of activity; dosage and mode of use; therapeutical indications; resistance; side effects;
43-45	ENDOANTIPARASITICS	Antinematodic drugs: chemical structure and categorization; mechanism of activity; dosage and mode of use; therapeutical indications; resistance; side effects;
		Antitrematodic and anticestodic drugs: chemical structure and categorization; mechanism of activity; dosage and mode of use; therapeutical indications; resistance; side effects;
		Antiprotozoar drugs: anticoccidial, antitrypanosomial, antibabesicydic, drugs against hystomoniasis (chemical structure and categorization; mechanism of activity; dosage and mode of use; therapeutical indications; resistance;

		side effects)

PRACTICALS

V Semester

No of lessons	*Teaching unit and contents of teaching unit*
1- 2	**Introduction:** Categorization of drugs. Drug nomenclature. Control, traffic, evidence, pooling, expiring date, demission of drugs. Information about the drugs.
3-4	ATS classification of drugs. Measures in pharmacy practice. Drug dosage. Drug administration mode.
5-6	**Drug prescription (recipient) I:** What is recipient? Containment of recipient: Inscriptio, Invocatio, Ordinatio, Subscriptio (preparation form and issuing form), Signatura, Nomen medici, Nomen aegroti
7-8	**Drug prescription (recipient) II:** Prescribing of magistral, officinal and manufactured drugs. General remarks concerning writing of recipient (Formulae officinales и Formulae magistrales). Prescription narcotic drugs and psychotropic substances.
9-10	**Crude forms of drugs I:** Pulveres . Pulveres non divisi et pulveres divisi.
11-12	**Crude forms of drugs II:** Capsulae medicinales. Prescription of officinal and manufactured capsules.
13-14	**Crude forms of drugs III:** Tablettae. Variations of tablets, prescription of manufactured and officinal tablets.
15-16	**Crude forms of drugs IV:** Solublettae. Vaginalettae. Suppositoria. Boli.
17-18	**Half crude forms of drugs I**: Unguenta. Liniment bases. Water non-soluble bases. Water soluble bases.
19-20	**Half crude forms of drugs II:** Use of liniments (application on the skin and mucosas). Prescription of manufactured, officinal and magistral liniments.
21-22	**Half crude forms of drugs III:** Oculenta. Pastae. Prescription of manufactured, officinal and magistral pastae. Electuaria.
23-24	**Liquid forms of drugs I:** Solutiones medicinales. Prescription of manufactured, officinal and magistral solutions for external and internal use. Mixturae
25-26	**Liquid forms of drugs II:** Suspensiones medicinales. Prescription of manufactured suspensions, magistral prescription of suspensions.
27-28	**Liquid forms of drugs III:** Emulsiones medicinales. Prescription of emulsions.
29-30	**Liquid forms of drugs IV:** Injectiones. Prescription of injections.

VI Semester

1-4	**Liquid forms of drugs V:** Guttae. Oculoguttae. Otoguttae. Rhinoguttae.
5-8	**Liquid forms of drugs VI:** Infundibilia. Inhalationes. Klysmata. Mucilagines.
9-12	**Liquid forms of drugs VII:** Macerata, Infuza, Decocta, Extracta, Tinctura, Mixtura
13-20	Prescription of exam recipients
21-22	Administration of drug in laboratory animals p/o, s/c, i/m, i/v, i/perit.
23-24	Blood sampling in laboratory animals and determination of drug concentration in biological material.
25-26	Detecting and effect of drugs on blood pressure in rat. Demonstration of direct and indirect method.
27-28	Effect of drugs on isolated heart of rabbit.
29-30	Visit of pharmacist.

Organization	***V Semester:*** Theory classes: 2 lessons a week (30 lessons) Practicals: 2 lessons a week (30 lessons) ***VI Semester:*** Theory classes: 3 lessons a week (45 lessons) Practicals: 2 lessons a week (30 lessons)
Teaching methods	Theory classes and seminars: interactive (lectures in group with discussion and active participation of the students). Practicals: auditory practicals, laboratory practicals and other ways of work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	*Points*	
	minimum	*maximum*

	<table><tr><td>**Attendance on theory classes**</td><td>**12**</td><td>**15**</td></tr><tr><td>**Attendance and activity (knowledge) on practicals**</td><td>**12**</td><td>**15**</td></tr><tr><td>**Periodical evaluations (three)**</td><td>**10(x3)=30**</td><td>**20(x3)=60**</td></tr><tr><td>***Final exam**</td><td>**6**</td><td>**10**</td></tr><tr><td>**Total:**</td><td>**60**</td><td>**100**</td></tr></table> **Prerequisite criteria:** For being able to pass the final exam student has to gain minimum 12 points from theory classes and practicals, respectively, and up to 10 points per evaluation for the three periodical evaluations. If student does not show result (less then 10 points) on the some of the periodical evaluations, he/she has to go on one of the predicted reparative periodical evaluations. Final exam is required for students who did gain less then 60 points with attendance on theory classes and practicals, and the three periodical evaluations.
Evaluation of knowledge	**Periodical evaluations (three):** written First periodical evaluation: Општа фармакологија Second periodical evaluation: Специална фармакологија (органски системи) Third periodical evaluation: Хемотерапевтици ***Final exam:** written (proscription of recepies) and oral **Final grade mark forming criteria:** <table><tr><th>*Points*</th><th>*Grade mark*</th></tr><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></table>
Basic teaching aids	***THEORY CLASSES*** 1. В. Ќупиќ, М. Муминовиќ, С. Кобал, Р. Велев: **Фармакологија за студентите по ветеринарна медицина**. Белград, Сараево, Љубљана, Скопје. 2007 2. Авторизирана скрипта со наслов: Општа фармакологија (автор: Р. Велев) ***PRACTICALS*** 1. Hadzović S.: **Veterinarska farmakografija sa osnovama farmakoterapije.** Svjetlost, Sarajevo 1986. 2. Živanov D.: **Osnovi veterinarske recepture.** Veterinarski fakultet Univerziteta u Beogradu, Beograd, 1996.
Recommended literature	1. Adams H. R.: **Veterinary Pharmacology and Therapeutics.** 8-th edition. Iowa State University Press. Ames, 2001. 2. Brander G. C., Pugh D.M.: **Veterinary Applied Pharmacology and Therapeutics.** 5-th edition. Bailliere Tindall. London, 1991. 3. Prescott. J. F., Baggot J. D., Walker R. D.: **Antimicrobial Therapy in Veterinary Medicine.** 3-rd edition. Iowa State University Press. Ames, 2000. 4. Sakar, D.: **Antimikrobna kemoterapija.** Bo: Srebočan, V. и Gomerčić, H.: Veterinarski priručnik. 4 izdanje, JUMENA, Zagreb 1989. 5**.** Plumb.C D.: **Veterinary Drug Handbook.** 4-th edition. Iowa State University Press. Ames, 2002.

Course	**PATHOLOGY**	**12.5 credit points**
Code	**FVM 313**	
Year of study	**Third (III)**	
Semester	**Fifth and Sixth (V and VI)**	
Total teaching lessons	**165 (75+90)** **V semester 2+2 (30+30)** **VI semester 3+4 (45+60)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	ass. prof. Trpe Ristoski, PhD	
Realized by	ass. prof. Trpe Ristoski, PhD	
Purpose and objectives of the course program	**The theory classes** for the course Pathologic morphology are divided in two parts. The first part covers the General pathology which is studied in the V semester and introduces the pathologic processes and pathologic conditions in the organism which goal is a better understanding of the pathogenesis of the diseases to the students. The second part covers the Special pathologic	

	morphology which is studied in the VI semester. The special pathologic morphology has the purpose to acquaint the students with the pathoanathomic changes of all the organic systems. The correct establishment of the pathoanathomic changes will make the final diagnostic of the animals death easier for the students. **The practicals** are also divided in two parts. The first part (V semester) has the purpose to acquaint the students with the basic characteristics of the pathohistological diagnostics, regarding the collecting and the preparation of the material for pathohistological diagnostics, the staining of the pathohistological preparates as well as establishing the final pathohistological diagnose. The second part (VI semester) has the purpose to acquaint the students with the equipment and the way of performing the autopsy of the animals. During the lectures every student will have the possibility to perform autopsy on different animal species (ruminants, nonruminants and poultry) and at the same time to notice the pathoanatomical changes and to establish the reason for the death of the animal.

Contents

THEORY CLASSES

No of lessons	Teaching unit	Contents of teaching unit
V Semester		
1-2 lessons	Introduction and history of the pathology	The introduction will contain the pathological process i.e. the disease- what is disease and the conditions for its' occurring and the pathological conditions i.e. the pathoanatomical changes that develop as a consequence of the disease. Heterotopy, heterohrony and heterometry in the occurring of the disease. The history part will contain the historic path of the development of pathology since Hypocrite to today. An accent will be put on the hymoral, solirad, cellular and molecular pathology, as well as the history and development of the autopsy.
3-6 lessons	Etiology	The etiology will present the causes and the conditions for the occurring of the disease. The essential, assisting and proximal factors as well as the interior and exterior factors for the occurring of the disease.
7-10 lessons	Degeneration and necroses	The changes that are developed as a consequence in the metabolism. The morphologic changes in the cell, tissues and organs that are developed as consequence of the disturbed metabolism, are known as degenerations An accent will be put on the: atrophy, the changes developed as a consequence of the disturbance in the metabolism of the proteins, fats, carbohydrates, exogen and endogen pigments. The necroses will be studied from the aspect of the causes for its' occurring, the forms of necroses, the microscopic and macroscopic changes and their characteristics. Also we will study the physiologic necroses- apoptosis.
11-14 lessons	Circulatory system disorders	Local disorders in the circulatory system: ischemia, infarction, hyperemia, stasis, hemorrhage, thrombosis, emboli and metastasis.
15-16 lessons	***TEST No 1***	
17-22 lessons	Inflammation	The inflammations will be studied in 6 hours from the aspect of morphologic and functional changes of the tissue and the corresponding blood vessels developed as a result of the influence of different harmful agents. We will present the cardinal signs of the inflammation. The inflammatory components: alterative, exudative and proliferative changes. The biochemical processes of the inflammation. The course and the outcome as well as the types of inflammation. Every inflammation will be studied in detail. We will pay better attention on the specific inflammations: TBC est.
23-24 lessons	Regeneration	Types of regeneration, perfect and imperfect recovery. Better attention will be payed at: recreation, absorption, regeneration, organization, accommodation est.
25-26 lessons	Tumours, malformations and death	The tumours will be studied from the aspect of: occurring, composition and nomenclature. We will describe macroscopically and microscopically every tumour (benign or malignant) of different tissues and organs. The science that studies the malformations is Teratology. Formal and causal genesis of the occurring of malformations. Separate and connected malformations. What is death, types of death (clinical and biological death). What is agony,

		subclinical death and exitus.
27-28 lessons	Immunopathology	The latest discoveries in the area of immunopathology, especially the autoimmune disease.
29-30 lessons	***TEST No 2***	
VI Semester		
1-6 lessons	Digestive system	Oral cavity, teeth, oesophagus, ingluvies, forestomachs, gaster and intestines.
7-9 lessons	Digestive system	Liver, Gallbladder, Pancreas
10-12 lessons	Hematopoietic organs	Bone marrow, Lymph nodes and Spleen
13-15 lessons	Circulatory system	Hart, Blood and Lymph nodes
16-18 lessons	Respiratory system	Nose and Nose vassals, Larynx, Trachea, Lungs and Pleura
19-21 lessons	***TEST No 3***	
22-24 lessons	Urinary system	Kidneys, urethers, urinary bladder, and urethra
25-27 lessons	Sex organs	*Male sex organs:* Testes, penis and preputium *Female sex organs:* Ovaries, ovarian ducts, uterus, vagina and udder
28-30 lessons	Central nervous system	Central and peripheral nervous system
31-33 lessons	Endocrine glands	Thyroid gland, parathyroid gland, thymus, Hypophisis, Epiphysis and suprarenal gland
34-36 lessons	Skeletal and muscular system	Bones, Joints, Muscles, Tendons, fascias, Ligaments, hoof and hooves
37-39 lessons	Hearing and sight organs	Eye and ear
40-42 lessons	Skin	Skin changes
43-45 lessons	***TEST No 4***	

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
V Semester	
1-2	Preparing and staining of the patohistological preparates
3-4	Microscopic diagnostic of the patohistological preparates: Degeneratio parenchymatosa renis (H.e.) Infiltratio adiposa hepatis equi (H.e.) Degeneratio et infiltratio adiposa hepatis equi (Sudan III) Degeneratio cerea musculi equi (H.e.) Degeneratio parenchymatosa hepatis (H.e.) Dystrophia haemorrhagica acuta hepatis equi (H.e.)
5-6	Microscopic diagnostic of the patohistological preparates: Necrosis centrolobularis hepatis vaccae (H.e.) Necroses miliares disseminatae hepatis galine (H.e.) Necrosis tubulorum renis vituli (H.e.) Amyloidosis lienis (H.e.) Icterus retentionis hepatis canis (H.e.) Melanuria renis equi (H.e.)
7-8	Microscopic diagnostic of the patohistological preparates: Antracosis pulmonis canis (H.e.) Hyperaemia passiva hepatis canis (H.e.) Amyloidosis renis (H.e.) Haemosidrosis hepatis equi (H.e.) Thrombosis ramorum arteriae pulmonis equi (H.e.) Endocarditis thrombotica septica suis (H.e.)
9-10	Microscopic diagnostic of the patohistological preparates: Infarctus haemorrhagicus lienis suis (H.e.)

	Amyloidosis hepatis (H.e.) Pharyngitis phlegmonosa abscedens equi (H.e) Tonsilitis necroticans suis (H.e.) Erosio chronica mucosae ventriculi suis (H.e.) Myocarditis embolica equi (H.e.)
11-12	Microscopic diagnostic of the patohistological preparates: Newcastle encephalitis (H.e.) Myositis sarcemphysematosa vacae (H.e.) Enteritis acuta catarrhalis canis (H.e.) Colitis dyphteroides paratyphosa suis (H.e.) Colitis dyphteroides circum scripta suis (H.e.) Trichinelosis musculi suis (H.e.)
13-14	Microscopic diagnostic of the patohistological preparates: Pneumonia enzootica suum (H.e.) Sarcosporidiosis myocardii suis (H.e.) Actinomycosis cutis suis (H.e.) Tuberculosis miliaris disseminata hepatis similae (H.e.) Pneumonia caseosa tuberculosa simile (H.e.) Pneumonia fibrinosa partim necroticans equi (H.e.)
15-16	Microscopic diagnostic of the patohistological preparates: Bronchopneumonia purulenta lobularis embolica equi (H.e.) Pneumonia interstitialis chronica equi (H.e.) Pneumonia chronica lobularis verminosa disseminata felis (H.e.) Mastitis parenchymatosa purulenta vaccae (H.e.) Distomatosis hepatis (H.e.) Lipoma mesenterii equi (H.e)
17-18	Microscopic diagnostic of the patohistological preparates: Sarcoma macrofusicellulare periostale canis (H.e.) Melanosarcoma caudae equi (H.e.) Carcinoma planocellulare penis equi (H.e.) Carcinoma planocellulare - cancroid perinei vaccae (H.e.) Cirrhosis postnecroticans hepatis suis (H.e.) "Cirrhosis" parasitaria hepatis vacae (H.e.)
19-20	Microscopic diagnostic of the patohistological preparates: Hepatitis interstitialis chronica parasitaria muliplex suis (H.e.) Nephritis interstitialis chronica et degeneratio cystica renis (H.e.) Nephritis interstitialis chronica scleroticans canis – ren cicatricosus (H.e.) Carcinoma medullare mammae canis (H.e.) Coccidiosis intestini gallinae (H.e.) Bronchopneumonia purulenta desquamativa suis (H.e.)
21-22	Microscopic diagnostic of the patohistological preparates: Polyomyelitis enzootica suum – Z.U.S. (H.e.) Meningoencephalitis purulenta abscedens (H.e.) Colaps glandule thyreoideae suis (H.e.) Hepatits contagiosa canis – HCC (H.e.) Epitheliosis contagiosa cutis galinae – variola avium (H.e.) Papilloma cutis canis (H.e.)
23-24	Microscopic diagnostic of the patohistological preparates: Psammoma (H.e.) Gastritis catarrhalis chronica hyperplastica suis (H.e.) Myocarditis aphtosa suis (H.e.) Bronchopneumonia catarrhalis purulenta canis (H.e.) Aspergillosis pulmonis meleagridis (H.e.) Endometritis chronica cystica canis-pyometra (H.e.)
25-26	Microscopic diagnostic of the patohistological preparates: Myositis chronica maseteris equi (H.e.) Myositis haemorrhagica et necroticans equi (H.e.) Tuberculosis nodularis intralobularis mammae vaccae (H.e.) Pseudotuberculosis cavaiave cobaye (H.e.) Botryomycosis cerebri equi (H.e.) Abscesus malleosus lymphonoduli equi (H.e.)
27-28	Microscopic diagnostic of the patohistological preparates: Pneumonia acuta abscedens malleosa equi (H.e.) Degeneratio hyaloides lienis (H.e.) Hepatits paratyphosa disseminata suis (H.e.)

	Lymphadenitis haemorrhagica acuta suis (H.e.) Leucosis hepatis gallinae (H.e.) Hepatitis parasitaria traumatica acuta (H.e.)
29-30	Microscopic diagnostic of the patohistological preparates: Fibroma durum subcutis canis (H.e.) Fibro-myoma uteri canis (V.G.) Hyperaemia et oedema pulmonis (H.e.) Tuberculosis milliaris pulmonum cuniculi (H.e.) Tuberculosis chronica nodularis productiva lymphonoduli vaccae (H.e.) Hyperaemia lymphadenoides lineis equi (H.e.)
VI Semester	
1-4	Introduction in the necropsy of the domestic animals (theoretic)
5-8	Necropsy of ruminants (ships and goats)
9-12	Necropsy of ruminants (ships and goats)
13-16	Necropsy of ruminants (ships and goats)
17-20	Necropsy of nonruminants (dogs, cats and pigs)
21-24	Necropsy of nonruminants (dogs, cats and pigs)
25-28	Necropsy of nonruminants (dogs, cats and pigs)
28-32	Necropsy of nonruminants (dogs, cats and pigs)
33-36	Necropsy of poultry Обдукција на живина
37-40	Necropsy of poultry
41-44	Necropsy of poultry
45-48	Organic pathology
49-52	Organic pathology
53-56	Outdoor necropsy on big animals
57-60	Outdoor necropsy on big animals

Organization	***V Semester:*** Theory classes: 2 lessons a week (30 lessons) Practicals: 2 lessons a week (30 lessons)
	VI Semester: Theory classes: 3 lessons a week (45 lessons) Practicals: 4 lessons a week (60 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals (pathohistology diagnostics during V semester animal necropsy during VI semester) Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on practicals	**12**	**15**
Written assay	**3**	**5**
Periodical evaluations (four)	**10**	**20**
Practical exam	**13**	**20**
Final exam	**10**	**25**
Total:	**60**	**100**

	Prerequisite criteria: For being able to pass the complete final exam (oral and practical part), student has to gain up to 45 points from theory classes, practicals, written assay and four periodical evaluations. If the student gains up to 50 points from theory classes, practicals, written assay and four periodical evaluations, he/she is liberated from the oral part of the exam. Student is required to pass practical parts of the exam.
Evaluation of knowledge	**Periodical evaluations (four):** written **First periodical evaluation**: Introduction and history of pathology; Etiology; Degenerations; Necroses; Disorders in the circulatory system. **Second periodical evaluation**: Inflammation; Regeneration; Tumours, malformations and death;

	Immunopathology. **Third periodical evaluation**: Digestive system; Hematopoetic system; Circulatory system; Respiratory system. **Fourth periodical evaluation**: Urinary system; Sex organs; Central nervous system; Endocrine glands; Skeletal and Muscular system; Organs for sight, hearing and Skin. **Practical exam:** Pathohistology and necropsy **Final exam:** oral **Complete final exam:** oral + practical (pathohistology and necropsy) **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. Ц. Мицевски и Т. Ристоски: Патолошко хистолошки практикум. Вет.факултет, Скопје, 2003. 2. Мицевски Ц.: Обдукција на домашните животни. Вет. фак. Скопје, 1998. 3. Ц. Мицевски и Т. Ристоски: Штенечак - чума кај кучињата, Вет. Фак., Скопје, 2003 4. Norman Chevile: Ultrastructural pathology, 1994 5. Kumar, Cotran, Robbins: Basic Pathology, 7th edition, 2003 6. Милијана Кнежевиќ и Милијан Јовановиќ: Општа патологија. Макарије, 1999. 7. Culjak K. i sur. : Opsta veterinarska patologija. Horzetsky, Zagreb, 1993. 9. Софреновиќ Ѓ.: Општа патологија. Научна кнјига, Београд- 1990. 10. Jubb K., Kenedy P., Plamer N.: Pathology of domestic animals, 1992. 11. Чуљак К., Судариќ Ф.: Специјална патолошка морфологија животиа. Заг-Сар.1990

Course	**PARASITOLOGY AND PARASITIC DISEASES**	**10.0 credit points**
Code	**FVM 314**	
Year of study	**Third (III)**	
Semester	**Fifth and Sixth (V and VI)**	
Total teaching lessons	**135 (60+75)** **V semester 2+2 (30+30)** **VI semester 2+3 (30+45)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Dino Chrchev, PhD ass. prof. Jovana Stefanovska, PhD	
Realized by	ass. prof. Jovana Stefanovska, PhD	
Purpose and objectives of the course program	The study of the course **Parasitology and parasite diseases is made up of theoretical and practical part.**. The theoretical part includes the morphology, biological characteristics, developments cycles, pathogenesis and immunity, clinical symptoms, diagnostics, treatment and prevention of major representatives of 5 groups of parasites in the taxonomic manner. (Protozoa, Platyhelminthes, Nematoda, Acanthocephala и Arthropoda). The practical part is concerned on the morphology of adults and morphology of the development forms of parasites, development cycles and methods of diagnostics. The practical part is done in a lab with microscopes and microscopical parasite samples, micrometry, you get familiarized with the determination of parasites and the general methods of diagnostics of parasite diseases. The aim of this subject is to educate the students about parasites and parasite diseases which have particular importance in veterinary and public health. The knowledge that the students gain here will make it possible for them to independently determine, diagnose, treat and prevent parasite diseases in domestic animals and parasite zoonoses.	

Contents

THEORY CLASSES (Fifth semester)

No of lessons	*Teaching unit*	*Contents of teaching unit*
1-2	**Subject and contents or parasitology and parasite diseases in domestic animals. General parasitology**	Subject of parasitology, content of veterinary parasitology. Parasites, types of parasites, parasite evolution, morphology, anatomy and physiology of

		parasites, parasite hosts.
3-4	**General principles of parasite diseases 1**	Parasite invasion, epizootiology of parasite diseases, pathogenic effects of the parasites on the host, pathogenesis of parasite diseases, susceptibility and nonsusceptibility of parasites, immunity in parasite diseases.
5-6	**General principles of parasite diseases 2**	Conditions for appearance and spreading of parasites, diagnostics of parasite diseases, basis of fighting parasite diseases, economic and health meaning of parasite diseases, division of parasite diseases, treatment of parasite diseases, treatment of animals infected with parasites.
7-8	**Phylum Protozoa** **Subphylum Sarcomastigophora**	Morphologycal-biological and biochemical-physiological characteristics of protozoa. Subphylum Sarcomastigophora, *class Zoomastigophorea*, order Kinetoplastida, family Trypanosomatidae, genus Trypanosoma durina, coital disease, other pathogen trypanosomes)
9-10	**Order Kinetoplastida** **Order Diplomonadida**	Order Kinetoplastida, genus Leishmania, leishmanioses Order Diplomonadidae, family Hexamitidae, order Hexamita (Hexamitose, infective catarrhal enteritis) order Giardia,
11-12	**Order Trichomonadida**	Order Trichomonadida, family Trichomonadidae, genus Trichomonas (trichomoniasis in cattle, chicken, geese, humans and other domestic animals), family Monocercomonadidae, order Histomonas (Histomoniasis in turkey, black head) *Class Lobosea*, order Amoebida, family Entamoeboidae , genus Entamoeba
13-14	**Phylum Apicomplexa**,	Phylum Apicomplexa, *class Sporozoea*, order Eucoccididae, family Eimeridae, genus Eimeria (coccidiosis in chicken, turkey, pheasants, gees, ducks, rabbits, cattle, sheep and goat) genus Isospora (coccidiosis in carnivores, humans and birds)
15-16	**Family Cryptosporididae**	Family Cryptosporididae, genus Cryptosporidium (criptosporidiosis), genus Sarcocystis (sarcocystosis in ruminants, pigs, horses and carnivores) Genus Besnotia (Besnoitiosis),
17-18	**Family Cryptosporididae**	Genus Toxoplasma (Toxoplasmosis) genus Neospora
19-20	**Family Babesiidae** **Family Theileridae**	Family Babesiidae, genus Babesia (Babesiosis in cattle, sheep, goat, single hoofed animals, dogs and pigs) Family Theileridae, genus Theileria (Theileriosis in cattle, sheep, goat).
21-22	**Family Trichostomatidae** **Class Microspora** **Family Analplasmidae**	Family Trichostomatidae, genus Balantidium (Balantidiosis in pigs), Phylum Protophita, Family Anaplasmidae, Genus Anaplasma (anaplasmosis in ruminants), Genus Borelia (Boreliosis-spyrohextosis in poultry)
23-24	**Phylum Helminthes** **Phylum Plathelminthes (flat worms),** **Class Trematoda,**	Helminthes (Helminthes) taxonomy, Phylum Plathelminthes (flat worms), Class Trematoda, Family Fasciolidae, genus Fasciola (Fasciolosis- fluke) Family Dicrocoelidae, Genus Dicrocoelium (dicrocoeliosis), Family Paramphistomidae, Genus Paraphistomum (Paraphistomosis). Trematodes in poultry, Family Echinostomidae, Genus Echinostomum, Family Prostogonomidae, Genus Prostogonimus, Trematodosis in carnivores, Family Opistorchiidae, Genus Opistorchus
25-26	**Class Cestoda**	Class Cestoda, Family Taenidae,
27-28	**Class Cestoda**	Family Dilepididae ; Family Anoplocephalidae; order Pseudophyllidea; Family Diphyllobotridae

29-30	**Class Nematoda** **Family Strongyloidae** **Family Strongylidae**	Class Nematoda Family Strongylidae genus Strongylus,

THEORY CLASSES (Sixth semester)

1-2	**Family Trichostrongylidae**	Family Trichostrongylidae, (genus Trichostrongylus, pgenus Haemonchus, genus Ostertagia, genus Cooperia, genus Nematodirus, genus Hyostrongylus
3-4	**Family Ancylostomatidae** **Family Trichonematidae,**	Family Ancylostomatidae genus Globocephalus, genus Bunostomum, genus Ancylostoma, genus Uncinaria Family Trichonematidae genus Trichonema, genus Oespophagostomum, genus Chabertia
5-6	**Family Amydostomatidae,** **Family Syngamidae**,	Family Amydostomatidae ; genus Amidostomum, Family Syngamidae , genus Syngamus, genus Cyathostoma
7-8	**Family Trichuridae and Trichinellidae**	Family Trichuridae and Trichinellidae
9-10	**Family Dyctiocaulidae, Protostrongylidae, Metastrongylidae, family Amydostomatidae, Syngamidae,**	Family Dyctiocaulidae (genus Dictyocaulus), Family Protostrongylidae (genus Prtostrongylus), Metastrongylidae,
11-12	**Family Oxyuridae, Ascarididae, Heterakidae**	Family Oxyuridae, Ascarididae, Heterakidae
13-14	**Family, Habronematidae, Spriocercidae, Class Acantoceohala**	Family Thelazidae, Habronematidae, Spriocercidae, , Class Acantoceohala, Family Oligacanthorhinchidae
15-16	**Family Acuariidae, Filariidae, Onchorceiidae,**	Family Acuariidae, Filariidae, Onchorceiidae
17-18	**Helminthes diagnostics methods**	**(sedimentation, Flotation, Baerman method)**
19-20	**Phylum Arthtohropoda, systematic, Class Arachnida (spiderlike arthropods), Order Metastigmata**,	Phylum Arthtohropoda, Taxonomy, Class Arachnida (spiderlike arthropods), Order Metastigmata, Family Ixodidae (hard tics), Orders: Ixodes, Rhipicephalus, Dermacentor, Hyaloma, Haemophysalis, tic paralysis Family Argasidae (soft tics), Genus Argas, Order Mesostigamata, Family Dermanyssidae, Genus Dermanyssus, Order Prostigmata. Family Demodicidae, demodicosis in dogs, cats, pigs, cattle, sheep, goat, rabbits and horses.
21-22	**Order Oribatei** **Order Astigmata**	Order Oribatei, Family Trombididae, Order Trombicula Order Astigmata, Family Sarcoptidae, Genus Sarcoptes and Notoedres, Family Knemidocoptidae, Genus Knemidocoptes, Family Psoroptidae, Genus Psoroptes, Chorioptes and Otodectes (mange in sheep, goat, pigs, dogs, cattle, fowl, rabbits and cats.)
23-24	**Class Insecta,** **Order Dyptera,** **Suborder Brachicera**	Class Insecta, Order Dyptera, Suborder Brachicera, Family Tabanidae, Genus Tabanus Family Muscidae, Genus Musca , Haematobia and Stomoxys, Genus Calliphora, Family Sarcophagidae, Genus Sarcophaga
25-26	**Myasis in domestic animals**	Myasis in domestic animals: Family Gasterophilidae, Genus Gasterophilus (gastrophilosis in hoofed animals), Family Hypodermatidae, Genus Hypoderma, (Hipodermosis - gadfly in cattle), Family Oestridae, Genus Oestrus (oestrosis in domestic animals – sheep gadfly)
27-28	**Suborder Nematocera**	Family Culicidae, Genus Culex, Aedes, Anopheles, Family Simulidae, Genus Simulium, Family Psychodidae, Genus Phlebotmomus, Family Ceratopogonidae, Genus Culicoides Order Pupipara, Family Hyppoboscidae, Genus Hypobosca, Melophagus,
29-30	**Order Siphonaptera** **Phylum Pentastomida**	Order Siphonaptera, Family Pulicidae, Order Pulex и Ctenocephalides, Order Mallophaga, Family Trichodectidae, Genus Trichodectes, Felicola, Family Bovicolidae, Genus Bovicola, Order Anoplura, Family Haematopinidae, Order Haematopinus, Family Linognathidae, Genus Linognathus, Order Hemiptera, Phylum Pentastomida, Family Linguatidae, Genus

		Linguatula

PRACTICALS (Fifth semester)

No of lessons	*Teaching unit and contents of teaching unit*
1- 2	Rules of classification Equipment and apparatus in parasitological Laboratory Microscope study and micrometry of parasites and pseudoparasites
3-4	Diagnostics methods for protozoar determining
5-6	Microscope examination Microscope samples from the following genuses: Genus Trypanosoma , Genus Leishmania
7-8	Microscope examination Microscope samples from the following genuses: Genus Hexamita , Genus Giardia,
9-10	genus Trichomonas, Genus Histomonas , Genus Entamoeba
11-12	Microscope examination Microscope samples from the following genuses: Genus Eimeria Genus Isospora
13-14	Microscope examination and diagnostics Microscope samples from the following genuses: Genus Cryptosporidium, Genus Sarcosystis, ,Genus Besnotia
15-16	Microscope examination Genus Toxoplasma , Genus Neospora
17-18	Microscope examination Microscope samples from the following genuses: Genus Babesia ,Genus Theileria
19-20	Microscope examination Microscope samples from the following genuses: Genus Balantidium, Genus Anaplasma (anaplasmosis in ruminant animals), Genus Borelia
21-22	Coplorological methods for helminthes diagnostics
23-24	Microscope examination Microscope samples from the following genuses: Genus Fasciola, Genus Dicrodoelium, Genus Parapystomum,
25-26	Genus Echinostomum, Genus Prostogonimus, Genus Opistorchus
27-28	Microscope examination Microscope samples from the following genuses: Genus Taenia (T. soleum, saginata, T hydatigena,T. pisiformis, T. multiceps) and forms of larvae in taenia
29-30	Genus Echinococcus,Genus Dipylidium ,Genus Moniezia,Genus Anoplocephala

PRACTICALS (Sixth semester)

1-2	Microscope examination Microscope samples from the following genuses: Genus Strongyloides, Genus Strongylus vulgaris, S. edentatus, S.equinus
3-4	Microscope examination Microscope samples from the following genuses: Genus Trichostrongylus, Genus Hoemonchus, Genus Ostertagia, Genus Cooperia, Genus Nematodirus, Hyostrongylus
5-6	Genus Globocephalus, Genus Bunostomum, Genus Ancylostoma, Genus Uncinaria, Genus Trichonema, Genus Oesophagostomum, Genus Chabertia
7-8	Genus Amidostomum, Genus Syngamus, Genus Cyathostoma
9-10	Genus Trichuris, Genus Capilaria Genus Trichinella
11-12	Microscope examination Microscope samples from the following genuses: Genus Dictyocaulus, Genus Potostrongylus, Genus Metastrongylus,
13-14	Genus Ascaridia, Genus Oxyuris, Genus Heterakis
15-16	Microscope examination Microscope samples from the following genuses: Genus Thelazia, Genus Habronema, Genus Spirocerca, , Genus Macracanthorhinchus
17-18	Genus Filariidae, Genus Parafilaria, Genus Onchocerca, Genus Dirofilaria, Genus Gnathostoma
19-20	Microscope examination Microscope samples from the following genuses: Genus Ixodes, Genus Argas, Genus Dermanyssus, Genus Demodex
21-22	Genus Prostigmata. Genus Trombicula Genus Sarcoptes and Notoedres, Genus Knemidocoptes, Genus

	Psoroptes, Chorioptes and Otodectes
23-24	Microscope examination Microscope samples from the following genuses: Genus Tabanus Genus Musca, Haematobia, Stomoxys,
25-26	Methods of diagnostics and determination of ectoparasites
27-28	Genus Glossina, Genus Calliphora, Genus Sarcophaga
29-30	Genus Gasterophilus, Genus Hypoderma Genus Oestrus
31-32	Genus Culex, Aedes, Anopheles, Genus Simulium,
33-34	Genus Phlebotmomus, genus Culicoides, genus Hypobosca, Melophagus,
35-36	Genus Pulex and Ctenocephalides, Genus Trichodectes, Felicola, Genus Bovicola,
36-37	Genus Haematopinus, Genus Linognathus, Genus Pediculus Genus Linguatula
38-39	Detailed studying of larvae eggs in domestic animals parasite
40-41	Coprological analysis in dog and cat faces
42-43	Coprological analysis in pigs and horses faces
44-45	Coprological analysis in ruminants faces

<table>
<tr><td>Organization</td><td>Theory classes: 2 lessons a week (30 lessons)
Practicals: 2 lessons a week (30 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes
(one lecture takes 0.25 points)</td><td>13,5</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals
bad knowledge on practicals takes negative points (one practical takes 0.5 points)</td><td>17</td><td>19</td></tr>
<tr><td>Written assay</td><td>0,5</td><td>6</td></tr>
<tr><td>Periodical evaluations lectures and practicals (4)</td><td>7,5(X4) =30</td><td>15(X4) = 60</td></tr>
<tr><td>Total:</td><td>61</td><td>100</td></tr>
</table>
<table>
<tr><td>Final exam (if previous tests are not passed)</td><td>30</td><td>60</td></tr>
</table>
Prerequisite criteria: Final exam is required for students who did not pass periodical evaluations, or if the wont to gain higher grade mark. In that case, the points from the previous evaluations are deleted. If the student is satisfied with the points from some of the evaluations, he/she can re-pass only such evaluations from which results he/she is not satisfied, and the points from such evaluations are deleted. Student can not be absent on more than 3 practicals and lectures.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two): written
Evaluations are realized at the end of the semester.
First periodical evaluation: General parasitology , phylum Protozoa,
Second periodical evaluation: class Trematoda , class Cestoda
Third periodical evaluation: class Nematoda,
Fourth periodical evaluation: phylum Arthropoda
Evaluations contain material from the lectures and practicals.

Final exam: written
Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<tr><td>до 60</td><td>5 (Ф)</td></tr>
<tr><td>61-68</td><td>6 (Е)</td></tr>
<tr><td>69-76</td><td>7 (Д)</td></tr>
<tr><td>77-84</td><td>8 (Ц)</td></tr>
<tr><td>85-92</td><td>9 (Б)</td></tr>
<tr><td>93-100</td><td>10 (А)</td></tr>
</table></td></tr>
</table>

Basic teaching aids	1. Никола Геру, Жарко Маџиров: **Ветеринарна паразитологија и паразитни болести**.Универзитет Св"Кирил и Методиј", Скопје, 2003 2. Зоран Б. Кулишиќ: **Хелминтологија.** Универзитет у Београду, Факултет ветеринарске медицине, Београд 2000. 3. Dwight D. Bowman: **Parasitology for veterinarians**.W.B. Saunders company. 2000. 4. Norman D. Levine: **Veterinary protozoology**. Iowa State University Press.Ames, 1985

Course	**CLINICAL ANATOMY OF ANIMALS**	**3.0 credit points**
Code	**FVM 315**	
Year of study	**Third (III)**	
Semester	**Fifth (V)**	
Total teaching lessons	**30 (15+15)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Vlatko Ilieski, PhD ass. prof. Lazo Pendovski, PhD	
Realized by	prof. Vlatko Ilieski, PhD ass. prof. Lazo Pendovski, PhD	
Purpose and objectives of the course program	***Theory classes and practicals*** Objective of the course Clinical anatomy of the animals is to introduce the students with the clinical anatomy of the head and neck, the thoracic and pelvic limb, the thorax, the abdomen, and the pelvic cavity. The students will learn how to identify the bones and external bone features on live animal, will learn to identify the muscle attachments, will learn about surgical approach to the cavities of the head, the neck structures, and organs and other anatomical structures of the thoracic and abdominal cavity, those in the extremities, will learn the names of the openings associated with the cranial nerves, and will identify the direction and distribution of the surface nerves and vessels of the head, neck, body, tail and the extremities.	

THEORY CLASSES

Реден број часови / недели	***Teaching unit***	***Contents of teaching unit***
1	**CLINICAL ANATOMY OF THE HEAD 1**	Identification of the bones and external bone features on the skull of the dog, horse and cattle; to identify, explain, and compare the anatomy of the lips, cheeks, floor of the oral cavity, tongue, hard and soft palate, in cat, dog, horse, cattle, pig, and in sheep, and introducing in surgical approach to the cavities of the head (oral, nasal, ear cavities, sinuses). Identification of the weak spots for trauma most likely to occur, the location of the paranasal sinuses, guttural poaches, foramen lacerum, and the soft palate, detailed knowledge about sensory innervation of the horns, referring to the horn removal, the names of the openings and their positions associated with the cranial nerves, identification of the direction and distribution of the surface nerves of the head, identification of the surface features of the head, identification of the surface lymph nodes of the head, and identification of the large surface vessels of the body, and their directions.
2	**CLINICAL ANATOMY OF THE HEAD 2**	Identification of parotid, mandibular, sublingual and zygomatic salivary gland, and identification of the direction of their ducts, identification of chewing muscles, identification of muscle attachments, and its innervation and function, compare between species about differences in structure influence the way the animal get its food and digest it, and ophthalmological examination of the eye in cat and dog: the retinal vessels, the tappetum, optic papilla, the importance of eye examination in clinical ophthalmology, measuring the field of vision and its correlation with the color, investigation of eye anomalies, demonstration of macula caeca, and other evidence of the processing of the peripheral and central image.
Teaching material: Anatomy of the live animal (video presentation): Head, 37.00 minutes		
3	**CLINICAL ANATOMY OF THE NECK**	Identification of the muscles that form boundaries of the visceral contents of the neck, and to understand their ratio, knowledge about attachments of every muscle with its innervation and function, knowledge about the positions of the visceral structures in cranial and caudal parts of the neck including the pharynx, the larynx, the trachea, the esophagus, external and internal distribution of ligamentum nuchae, jugular groove, jugular vein, the common carotid artery, superficial neck lymph nodes, vagosympathic trunk, and recurrent laryngeal nerve.

Teaching material: Anatomy of the live animal (video presentation): Neck, 24.09 minutes		
4	**CLINICAL ANATOMY OF THE FRONTLIMB (Frontlimb 1)**	Identification of the bones of the frontlimb, the position of joint capsules with special leprosy for their approach, and emphasis on the distal extremities.
5	**CLINICAL ANATOMY OF THE FRONTLIMB (Frontlimb 2)**	Detailed knowledge of the peripheral innervation of the distal part of the extremity, with special emphasis on nerves blockage, knowledge about carpal joint, with leprosy of the communication between its different parts, knowledge about attachments (origin, insertion) of each muscle, as well as their innervation and function, the position of the tendon sheets, location of the naavicular bone and its attachments.
Teaching material: Anatomy of the live animal (video presentation): Front limb (arm and brachium) 18.08 minutes, front limb (forearm) 47.10 minutes		
6	**CLINICAL ANATOMY OF THE HINDLIMB (Hindlimb 1)**	Identification of the bones of the hindlimb, identification of the muscles of the hind limb, the position of the joint capsules with special leprosy for their approach, and emphasis on de distal part of the extremity.
7	**CLINICAL ANATOMY OF THE HINDLIMB (Hindlimb 2)**	Detailed knowledge of the peripheral innervation of the distal extremity, with special leprosy on nerve blockage, knowledge about stifle joint with emphasis on communication between its different parts, the position of the tendon sheaths, location of the navicular bone and its attachments.
Teaching material: Anatomy of the live animal (video presentation): Hindlimb 48.08 minutes		
8	**CLINICAL ANATOMY OF THE THORACIC CAVITY 1**	Location and attachments of the diaphragm and the ratio with the ribs, assessment of the different layers of the abdominal wall. Identification of the muscles from the thoracic wall, which are responsible for movements in the process of breathing, understanding the parietal (costal, diaphragmatic and mediastinal) and visceral (pulmonary) pleura or serous membrane and costodiaphragmatic recess, position of the costal arch, the line of pleural reflection and the boundaries of the lungs, revision of the position of the entrance of the thoracic cavity, and elongation of the pleural cavity, including the pleural cupola on the top of the lungs.
9	**CLINICAL ANATOMY OF THE THORACIC CAVITY 2**	Location of the heart and its valves, understanding the basic anatomy of the lung from a mammal, recognition of the differences of the lungs in domestic mammals, to be able to recognize and describe the functional anatomy of the oval foramen and arterial duct on the heart of the fetus.
Teaching material: Anatomy of the live animal (video presentation): Thorax 21.48 minutes		
10	**CLINICAL ANATOMY OF THE ABDOMINAL CAVITY 1**	Identification of the topographic anatomy of the abdominal viscera including the bladder, spleen, liver (different parts), gallbladder, stomach, small and large intestines (different parts), pancreas, adrenal glands, kidneys, ovaries, uterus and the urethers.
11	**CLINICAL ANATOMY OF THE ABDOMINAL CAVITY 2**	Topography of each type of position of the organs which are placed one by one, understanding the arrangement of the peritoneum which covers the abdominal viscera and hang it from the abdominal wall, as well as formation of ligaments between the different organs (large and small omentum, omental bursa, mesoduodenum, mesentery, and mesocolon, the ligaments of the liver, the ovaries and the ligaments of the uterus), localization of the inguinal canal, and vaginal tunic in male and female animals, to determine the position of the liver inside the skeleton, to demonstrate the anatomy of the composite stomach of ruminants both on fresh and on fixated preparations, to consolidate the understanding of comparative anatomy and physiology of the digestive system. Fresh and fixated gastrointestinal tissues from mammals will be available as basis for interactive discussion for anatomical structure and function related to different regions of the digestive system, knowledge about position of, and different parts of the intestinal features of various parts of the small and large intestines (haustre, tenues, vascularisation, lymph nodes).
Teaching material: Anatomy of the live animal (video presentation): Abdomen 38.00 minutes		
12	**CLINICAL ANATOMY OF THE PELVIC CAVITY 1**	Identification of the visceral organs in pelvic cavity: the rectum, bladder, urethers, urethra, deferent duct, as well as its associated structures (anal glands, accessory genital glands), identification of different parts of the kidneys from dog, cat, sheep, pig, cattle and horse, observation of comparative bladders: orientation in pelvic canal, position of the urethers and urethra, observation of differences of bladders form both genders. **Teaching material: Anatomy of the live animal (video presentation):** Pelvic cavity and external genitalia 41.00 minutes.
13	**CLINICAL**	**Anatomy of the female reproduction,** understanding the structure of the ovary

	ANATOMY OF THE PELVIC CAVITY 2	including the possibility to identify the follicles and corpora lutea in domestic species, understanding the differences in anatomy that are found in ovaries in domestic species. Understanding the position and ratio of the ovaries inside the abdomen in domestic species, understanding the anatomy of the oviducts, uterus, vagina and the vestibule, understanding the differences in anatomy of the female reproductive system between domestic species, understanding the arrangement of the broad ligaments and formation of the ovarian bursa. **Placenta** understanding the anatomy of the fetal and mother components in the placenta of sow, mare, ewe, cow, bitch and queen. **Mammary gland - the udder** - understanding the general organization of the mammary glands in domestic species, including the supportive tissue, blood vessels, venous drainage, gland tissue, and canalicular system, the structure of the teat and differences in number in teat ducts in domestic species, appearing of the cell components in non-lactating and lactating mammary glands, understanding the position and anatomy of the inguinal canal and vaginal tunic, and the structures palpable per rectum.
14	**CLINICAL ANATOMY OF THE PELVIC CAVITY 3**	**Anatomy of the male reproductive system,** understanding the anatomy of the testis and spermatic cord in domestic species, understanding the anatomy of the penis and accessory glands in domestic species.
Teaching material for Module 6: Video presentation, 1. Thorax of the horse 10.03 min., 2. Thorax of the horse 17.52 min., 3. Thorax of the cattle 20.44 min., 2. Thorax of the cattle 8.25 min., 3. Thorax of the horse 13.25 min., 3. Thorax of the cattle (heart) 15.01 min. **Power point presentation:** Presentation for dissection of the thorax (30 slides) **CLIVE computer interactive program (quizzes).**		
15	**PRE-EXAM PERIODICAL EVALUATION WEEK**	

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***	
1	**CLINICAL ANATOMY OF THE HEAD 1**	Dissection of non-fixated head from sheep, dog, pig and horse to show surface structures, dissection of the chewing muscles and salivary glands, dissection of the deeper structures of the head, including the muscles of the tongue and soft palate, and to identify the nasal conch and meatuses of the nasal cavity in dog.
2	**CLINICAL ANATOMY OF THE HEAD 2**	Identification with dissection and demonstration the parts, cartilages, ligaments, laryngeal ventricles and muscles of the larynx in domestic species, comparation of the head anatomy in typical herbivores with the dog who is typical carnivore (who was dissected in the first semester), identification of the extrinsic muscles of the tongue, to identify the attachments, innervation and function of each muscle, identification of the muscles of the soft palate and pharynx, identification and classification the dental tissues in all teeth, identification of the permanent teeth in dog, cat, cattle, pig, sheep and examples of laboratory animals, evaluate the functional implication of the differences in structure within individuals and between species, differentiation between dolichocephalic and brachiocephalic type of breed, and between deciduous and permanent dentition (tooth), estimation and acquisition of additional anatomical knowledge obtained in the first year course using videos and dissectioned brains from different species, comparation of the brains form different species recognizing the similarities in the general structure of the mammalian brain, and description of the main regions of the brain from transverse and other sections, description of the relative position of the twelve cranial nerves and their nuclei.
3	**CLINICAL ANATOMY OF THE NECK**	Identification of the esophagus, identification of its relation to larynx, vascularisation of the esophagus and stomach (dog).
Teaching material: Anatomy of the live animal (video presentation): Neck 24.09 minutes.		
4	**CLINICAL ANATOMY OF THE FRONTLIMB (frontlimb 1)**	Identification of the bones of the frontlimb, students must know to palpate key anatomical features of the front limb in dog, while showing position of each bone and joint, knowledge about muscle attachments (origin, insertion), as well as its innervation and function, to identify the muscles that act on shoulder and elbow joint, to understand their ratio (their connection), knowledge how and where to palpate supraspinous, infraspinous, deltoid, biceps, triceps and brachial muscle, knowledge about the external fetures of the bones of the fore arm (the radius, ulna), understanding how radiograms are produced and how they are interpreted, to accomplish complete interpretation of the radiograms from arm and brachial region, identification of the muscles that act on carpal joint and digital joints, and to

		understand their ratio and their attachments (origin, insertion) of each muscle, their innervation and function, knowledge about the external features of the carpal bones, metacarpals, and phalanges, and to accomplish complete interpretation and understanding of the radiograms taken from antebrachium and fore paw.
5	**CLINICAL ANATOMY OF THE FRONTLIMB (frontlimb 2)**	Functional anatomy of the joints and factors limiting the each joint movements, knowledge how and where to palpate the neck superficial lymph nodes, and cephalic veins, knowledge how and where to palpate the carpal, metacarpal and the five digital cushions.
Teaching material: Anatomy of the live animal (video presentation): Front limb (arm and brachium), 18.08 min., front limb (forearm) 47.10 min. **Video presentation:** *Connection of frontlimb 8.45 min. Innervation of frontlimb 12.12 min.* **CLIVE computer interactive program (quizzes):** Anatomy of the front limb in dog: arm, brachium, forearm, forepaw region and innervation. Front limb in dog (complete anatomy). Front limb in horse 1, front limb in horse 2, front limb in horse 3, extremity topography in horse 1, frontlimb in cattle, front limb in dog (radiographic anatomy), front limb in cat (radiographic anatomy). Work with fresh, fixated and plastinated preparations.		
6	**CLINICAL ANATOMY OF THE HINDLIMB (hindlimb 1)**	**Practicals:** Identification of the bones of the hindlimb, recognition of external features of the bones of the pelvis, identification of the caudal and medial thigh muscles, the lateral hip muscles, and to understand their ratio, knowledge of the muscle attachments (origin, insertion) of each muscle, its innervation and function, knowledge about palpation of the external features of the femur, complete interpretation of radiographs taken from the pelvis, identification of caudal and lateral hip muscles, and to understand their ratio, knowledge about muscle attachments (origin, insertion) of each muscle, its innervation and its function, knowledge of external features of leg (tibia, fibula), complete interpretation of the radiographs taken from thight, stifle joint, and leg, identification of the craniolateral and caudal leg muscles, and understanding their ratio, knowledge about muscle attachments (origin, insertion) of each muscle, its inervation and its function, to recognize the external features from tarsal bones, metatarsals, and phalanges, knowledge how to palpate quadriceps femoris muscle, semitendinous, and gastrocnemius muscle.
7	**CLINICAL ANATOMY OF THE HINDLIMB (hindlimb 2)**	Interpretation of the radiographs of the hind paw, to know position of the main blood vessels and nerves of the pelvis, thight, leg, and hind paw, to know how and where to palpate femoral artery, popliteal lymph nodes, lateral saphenous vein and dorsal pedal artery, understanding the functional anatomy of the joints and factors who limit the movements of each individual joint, knowledge about how and where to palpate key anatomical features of hind limb in dog, showing the position of each bone and joint, and to know the metatarsal, and digital cushions.
Teaching material: Anatomy of the live animal (video presentation): Hind limb 48.08 minutes.		
8	**CLINICAL ANATOMY OF THE THORACIC CAVITY 1**	Identification of the vertebrae, ribs and sternum in dog, identification of external features of vertebrae, understanding limitations of vertebral joints, dissection and identification of the muscles of the body wall, knowledge about muscle attachments and function of each muscle, understanding the structure of the diaphragm, and knowledge about position and content of the openings, understanding about rectus muscle sheath in dog, dissection of the cremaster muscle, and to follow its origin, understanding the arrangement of the pleurae.
9	**CLINICAL ANATOMY OF THORACIC CAVITY 2**	Identification of the main structures from the left and right side of the thoracic cavity, competent interpretation of the radiographs taken from the thorax, understanding the functional anatomy of the next heart structures: left and right atria, left and right ventricle, auricles from atria, the heart valves and the ''heart skeleton'', the pericardium, epicardium, myocardium, and endocardium, the aorta, and pulmonary trunk, left and right coronary artery, arterious ligament, venous drainage of heart, large veins that drain the blood from systemic and pulmonary circulation to the heart, and the heart innervation.
Teaching material: Anatomy of the live animal (video presentation): Thorax 21.48 minutes		
10	**CLINICAL ANATOMY OF THE ABDOMINAL CAVITY 1**	**Practicals:** Identification of the veins who drain blood from the gastrointestinal tract to the portal vein, identification of the arterial branches which emerge from the aorta (the paired visceral, the paired parietal, and non-paired visceral arteries), and vascularisation of the organs they vascularise. Identification of the veins which drain blood to the caudal vena cava (the paired visceral, the paired parietal, and hepatic veins), investigation of the blood supply to the testes, ovaries, and uterus, understanding the pancreas and associated ligaments (dog).
11	**CLINICAL ANATOMY OF THE**	Student must identify, compare, and separate the anatomical components of the simple stomach in dog (cardia, fundus, corpus and pylorus), pig (gastric

	ABDOMINAL CAVITY 2	diverticulum) and horse (blind sac), demonstration of the attachments of the large and small omentum, studying the internal structures of the stomach (e.g. cardiac ostium, pyloric sphincter), to identify different regions of gastric mucosa in different species (e.g. proventricle in pigs, plicated margin in horses), identification of the parts of the pancreas (dog) – *in situ* and to investigate its relationships with the remaining organs, identification of the small and large omentum, the omental bursa, and epiploic foramen, the attachments of the viscera (between visceral organs) – trough ligaments, and duplicatures of the peritoneum, identification of isolated livers from dog, horse, cattle, pig and sheep and to identify its anatomical structures: the liver lobs, structures on liver diaphragmatic surface, and those on the liver visceral surface.
Teaching material: Anatomy of the live animal (video presentation): Abdomen 38.00 minutes		
12	**CLINICAL ANATOMY OF THE PELVIC CAVITY 1**	Identification of the muscles from the pelvic diaphragm (coccygeus and levator ani muscle) and sacroiliac ligament including its attachments, identification of the different peritoneal endings known as excavations, as well as ligaments in both genders, identification of visceral organs including the rectum, bladder, urethers, urethra, deferent duct, and its associated structures like anal glands (sacs), and accessory sex gland, then identification of various parts of the kidneys in dog, cat, sheep, horse, and cattle, differentiation between the structures of urinary tract like renal pelvis, renal crest, terminal recessuses, and renal calyces, comparation of bladders, - orientation in pelvic canal, position of the urethers and urethra, and comparation about differences in bladders from both genders. **Inguinal canal, reproductive tract, pelvis** - examination of the pelvic canal, descent of the testes, castration anatomy, disposition of the female reproductive tract. **Teaching material: Anatomy of the live animal (video presentation): Pelvis and external genitalia, 41.00 minutes.**
13	**CLINICAL ANATOMY OF THE PELVIC CAVITY 2**	Disposition of the female reproductive tract.
14	**CLINICAL ANATOMY OF THE PELVIC CAVITY 3**	**Inguinal canal, reproductive tract, pelvis** - examination of the pelvic canal, descent of the testes, castration anatomy, disposition of the female reproductive tract.
Teaching material: Anatomy of the live animal (video presentation): Pelvis and external genitalia, 41.00 minutes.		
15	**PRE-EXAM PERIODIC EVALUATION WEEK**	

Organization	Theory classes: 1+1 lessons a week (15 lessons) Practicals: 1+1 lessons a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work. Realization with work in dissection hall and processing of anatomic models.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on practicals	**12**	**15**
Written assay	**6**	**10**
Periodical evaluations (five)	**30**	**60**
Final exam	**predicted**	
Total:	**60**	**100**

Evaluation of knowledge	**Periodical evaluation (after each completed module):** written **Final exam:** predicted **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. L Konig H.E., Liebich H.-G. Veterinary anatomy of domestic animals. Schattauer(Stuttgart - new York) textbook and Colour Atlas, 2004 2. Sisson S., The anatomy of domestic animals. W.B. Saunders Company. Philadelphia and London, 1941 3. Dyce K.M., Sack W.O., Wensing C.J.G. Textbook of veterinary naatomy. W.B. Saunders Company. Philadelphia- London-Toronto-Sydmey_Montreal-Tokyou.1996 4. Симич В., Јанкович Ж. Анатомија домачих животиња сисара - Спланцхнологиа. Ветеринарски факултет-Београд,1997 5. Evans E., de Lahunta A. Guide to the dissection of dog. W.B Saunders Company Philadelphia-London-Toronto. 1971 6. Evans E., Christensen G. Anatomy of the dog. W.B Saunders Company Philadelphia-London-Toronto. 1979 7. Nomina Anatomica Vetreinaria. Internationa committee on veterinary Gross anatomical Nomenclature, Gent, Belgium,1992 8. Петков К. Анатомија на домашните животни. Скопје 1993		

Course	**BASIS OF CLINICAL AND LABORATORY DIAGNOSTICS**	**4.0 credit points**
Code	**FVM 316**	
Year of study	**Third (III)**	
Semester	**Fifth (V)**	
Total teaching lessons	**60 (30 + 30)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Dine Mitrov, PhD	
Realized by	prof. Dine Mitrov, PhD ass. Igor Dzhadzovski, MSc	
Purpose and objectives of the course program	***Theory classes*** of the course Basis of clinical and laboratory diagnostics have aim to introduce the students with the main principles of the clinical and laboratory diagnostics. The clinical diagnostics is the link between preclinical and clinical education. Clinical diagnostics is a part of the clinical pathology which uses most recent scientific methods for determination of the disease. Subject of the clinical diagnostics are disease symptoms of particular organs and organic systems, and the manner of their collection, systematization and analysis is elaborated. The task of diagnostics is to detect the disease and to find its nature. During the preclinical education, student do not have opportunity to get knowledge about the features of the live animal. Even during the clinical education, student gets information about the appearance of the health animal. During this experience, the student has to learn to observe, to feel, to listen, for becoming able to make right decisions. If the methods of clinical examination are well solved, and if the student have learned the manner of examination of particular animal species, he/she would become able to find if this animal is healthy or ill. During the clinical examination the student has no possibility to find the subjective condition of the ill animal. Anyway, the student is able to make total objective examination, and has not the danger of the human doctor to be seduced with some unclear motives, as caprice, outrage, arrogance etc. **Practicals.** Investigation of the biological materials is important tool for finding correct diagnosis and prognosis of the disease. Recent veterinary science in big part is based on the laboratory diagnostics. Only relevant laboratory results could contribute in finding the diagnosis. The aim of the practicals is the students to become familiar with the main laboratory methods for investigation of blood, urine, milk and other body liquids. The most important objective of the course is to solve the methods and evaluation of the results of the analyses which are necessary for result interpretation in subclinical and clinical disorders. This course is upgrading of the knowledge gained in preclinical and clinical courses, and it is most effectively applied in the practical analysis of the biological materials. Main objective of this course is development of the student's abilities for using the theoretical knowledge in the routine practice. With the theoretical and practical knowledge, students would be able for correct interpretation of the laboratory results.	

Contents

THEORY CLASSES

No of lessons	*Teaching unit*	*Contents of teaching unit*
I	***BASIS OF CLINICAL DIAGNOSTICS***	
1	INTRODUCTION	Introduction, symptoms, diagnosis, prognosis, handling with animal during the examination, history of the disease, examination methods.
2-3	PREVIOUS INTRODUCTION WITH THE ILL ANIMAL	Previous introduction with the ill animal: Anamnesis, National
4-5	BASIC EXAMINATION OF THE ANIMAL	Examination of the animal – status praesens: Basic examination (habitus, trias – body temperature, pulse, breathing, ruminal contractions).
6	SPECIAL EXAMINATION OF THE ANIMAL	Examination of the animal – status praesens: Special examination (examination of the skin and subcutis, examination of the lymph nodes and lymph vessels, examination of the mucosas).
5	EXAMINATION OF RESPIRATORY ORGANS – UPPER RESPIRATORY TRACT	Examination of the respiratory organs – upper respiratory tract: nasal discharge, expiratory air, nasal mucosa, sinuses and airbags, larynx and trachea, coughing, sputum.
6-7	EXAMINATION OF RESPIRATORY ORGANS – LOWER RESPIRATORY TRACT	Examination of respiratory organs – lower respiratory tract: percussion of thorax, auscultation of thorax, punction of thoracic cavity..
8-9	EXAMINATION OF THE CARDIOVASCULARY SYSTEM	Examination of heart (heart stroke, percussion of heart, auscultation of heart, heart tones, heart murmurs, punction of the pericardial sack), examination of the peripheral blood vessels (pulse quality, ECG). Examination of the heart functional condition.
10-11	EXAMINATION OF THE DIGESTIVE TRACT IN EQUINES AND CARNIVORES – UPPER PART	Examination of the digestive tract – upper part Food and water consumption, chewing disorders, swallowing disorders, belching, vomiting Examination of oral cavity, pharynx and oesophagus.
12-13	EXAMINATION OF THE DIGESTIVE TRACT IN EQUINES AND CARNIVORES – LOWER PART	Examination of the digestive tract – lower part Examination of the abdomen and abdominal digestive organs (stomach, intestines), rectal exploration, examination of defecation act and excrements.
14-15	EXAMINATION OF THE DIGESTIVE TRACT IN RUMINANTS	Appetite, thirst and water consumption, rumination, belching, vomiting, defecation. Examination of oral cavity and pharynx, examination of oesophagus, preventricules (examination of the rumen and its contents, examination of reticulum, examination of omasum: percussion, palpation, auscultation, examination of abomasum: adspection, palpation, percussion, auscultation, examination of intestines: percussion, palpation, auscultation, rectal exploration, examination of feces.
16	EXAMINATION OF LIVER IN EQUINES AND CARNIVORES	Examination of liver in equines, liver biopsy, punction techniques. Examination of liver in carnivores. Examination of spleen in equines and carnivores.
17	EXAMINATION OF LIVER IN RUMINANTS	Examination of liver in ruminants: adspection, palpation and percussion. Special examination of liver.
18-19	EXAMINATION OF URINARY SYSTEM	Examination of the urinary system: urination, examination of kidneys, preparation of urine samples – catheterization, evaluation of main features and physical parameters of urine, chemical examination of urine, examination of urine sediment. Techniques for functional evaluation of the kidneys.

20-23	EXAMINATION OF THE NERVOUS SYSTEM	Examination of the nervous system: examination of head and vertebral column, examination of the psychic condition of the animal, pupillary and corneal reflex, examination of the cerebrospinal liquor, examination of sensibility, examination of motility (active movements, coordination, tonus, ataxia, vertigo, seizures and forced movements, epilepsy), examination of vegetative nervous system.
II	***LABORATORY DIAGNOSTICS***	
24-30		Laboratory and special diagnostic methods.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
I	***Clinical diagnostics***
1-2	Introduction, approaching to the animal, fixation and safety handling.
3-4	Anamnesis, national, habitus, trias and rumination (ruminants).
5-6	Skin, mucoses, lymph nodules and lymh vessels.
7-8	Respiratory tract.
9-10	Cardiovascular system.
11-12	Digestive tract, sondage (nasal and oral sonde), rectal exploration (horse, cattle).
13-14	Examination of abdomen in cattle.
15-16	Examination of abdomen in equines.
17-18	Urinary system, catheterization.
19-20	Locomotory system.
21-22	Nervous system.
II	***Laboratory diagnostics***
23-24	Preparation of material for laboratory analysis. Preparation of glass and equipment.
25-26	Description of the whole sampling procedure (blood, serum, plasma, milk, tissues, organs, organic systems or whole corps).
27-30	Interpretation of results.

Organization	Theory classes: 2 lessons a week (30 lessons). Practicals: 2 lessons a week (30 lessons).
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	Minimum	***Maximum***
Attendance on theory classes	**10**	**15**
Attendance and activity (knowledge) on Practicals	**17**	**22**
Written assay	**0**	**8**
Periodical evaluations, (two theoretical)	**5+5 (10)**	**10+10 (20)**
Periodical evaluations (practical)	**5+5 (10)**	**10+10 (20)**
Final test	**5**	**5**
Final exam	**0**	**10**
Total	**52**	**100**
Complete final exam	***Grade mark / Points*** **Six (6) / 20** **Seven (7) / 25** **Eight (8) / 31** **Nine (9) / 38** **Ten (10) / 45**	

Prerequisite criteria:

- To get right to attend final exam, the student has to gain minimum 40 points from the

<table>
<tr><td></td><td>attendance of theory classes and practicals, periodical evaluations and final test.
• If the student does not gain required minimum on the first periodical evaluation, he/she could not attend the second one.
• If the student passed only the first, but not the second periodical evaluation, that means that the student does not passed the periodical evaluations, so he/she could not gain points from this issue.
• Students who did not passed the periodical evaluations reach directly on final exam (if they have right to it).
• The complete final exam has written and oral part, and depending on the grade mark gained, the student gets appropriate points.
• Final exam could be attended by the students who had gained minimum 60 points from the attendance of theory classes and practicals, periodical evaluations and final test, but who want to get higher grade mark from one predicted according points gained. Final exam takes 10 points and correspondents with student's results. If the student's results are not corresponding with the grade mark wanted by the student, he/she keeps the grade mark got with previously gained points.
• If student gains minimum 60 points by all issues, he/she gets right to get grade mark in his/her index, according the points gained, without attending on final exam.
• If the student is not satisfied with the points gained on the periodical evaluations, he/she can cancel them, and with points gained by other issues attends to complete final exam and looses his/her right on points gained with periodical evaluations.
• Written assay is not obligatory. The student could ask for topic for written assay 30 days before the end of the semester, and the written assay must be delivered 10 days before scheduled term for exam.
• Final test is obligatory and it is done practically on the farm.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluations: written
First periodical evaluation: lesson 1-9 (theory classes); lesson 1-12 (practicals)
Second periodical evaluation: lesson 10-30 (theory classes); lesson 13-30 (practicals)
Final exam: written or oral
Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<tr><td>to 59,5</td><td>5</td></tr>
<tr><td>60-67</td><td>6</td></tr>
<tr><td>67,5-75</td><td>7</td></tr>
<tr><td>75,5-86</td><td>8</td></tr>
<tr><td>86,5-94</td><td>9</td></tr>
<tr><td>94,5-100</td><td>10</td></tr>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Aleksandar Cvetkovic, Vojislav Ciric, Miodrag Jovanovic, Vladimir Litricin, Zarko ljesevic, Desanka Marjanovic, Svetislav Punovic, Milorad Petrovic: Klinicka dijagnostika unutrasnjih bolest domacih zivotinja. Veterinarski fakultet Beograd, 1989.
2. Sinjov, A.V.: Klinicka dijagnostika unutrasnjih bolesti domacih zivotinja. Naucna knjiga. Beograd, 1951.
3. Slobodan Teodosic: Osnovi klinicke dijagnostike pasa. Prosveta. Nis, 1991.
4. Ivan Jazbec: Klinicno laboratorijska dijagnostika. Tiskarna Plesko. Ljubljana, 1990.
5. Peter Jackson and Peter Cockcroft: Clinical examonation of Farm Animals. University of Cambidge, UK, 2002.</td></tr>
</table>

Course	**DIAGNOSTIC IMAGING 3.0 credit points**
Code	**FVM 317**
Студиска Година	**Third (III)**
Semester	**Sixth (VI)**
Total teaching lessons	**45 (15+30)**
Course type	Compulsory
Prerequisities	
Author of the course program	prof. Dine Mitrov, PhD
Realized by	prof. Dine Mitrov, PhD
Purpose and objectives of	Diagnostic imaging techniques are upgrade of the knowledge gained in preclinical courses, and also introduce the students with application of this knowledge (from biophysics, anatomy and clinical

the course program	anatomy, histology, embryology, physiology, pathophysiology and pathology). The subject of Diagnostic imaging is mechanism of formation of X rays and their direct impact on organism, i.e. the patient, interpretation of the radiograms, with which the students become able to analyze the pathological changes, and this would be helpful for solving the clinical courses within curriculum. ***Theory classes*** of the course Diagnostic imaging have aim to introduce the students with main principles of veterinary basic and clinical radiology, physiotherapy and ultrasonography. Basic radiology is quite important discipline, and gives information about the formation and physical features of X rays, their application in medicine, radiation sources and also formation of radiogram, where students are introduced with some rules of projection and geometry of radiograms. Also, the students would be educated with technique of making X ray film in dark chamber (manually) or with device for automatic film making. The special part of the course – clinical radiology comprises elaboration of all organic systems and their analysis (with application of contrast media). Clinical radiology is very important part of veterinary medicine and deals with various issues of pathological disorders in the organs and organic systems in domestic animals. Success of radiological diagnostics depends on knowledge of physical features of X rays, radiology procedure and application of various contrast techniques for examination. Also, proper interpretation of the radiograms requires excellent knowledge of anatomy and pathomorphology, physiology and pathophysiology of the organs and organic systems in domestic animals. Not to forget benefits got from anamnesis, clinical and laboratory data which are necessary for complete radiologic diagnosis. This course also includes physiotherapy, i.e. basic principles of diagnosis and therapy, as well as development of physical techniques for therapy in veterinary medicine. Physiotherapy is one of the oldest techniques for therapy in medicine. But nowadays this is one of most sophisticated therapy techniques, which uses all recent knowledge from the field of electronics, ultrasound, lasers, ionization rays, acupuncture and artificial light resources. Knowledge from the field of physical medicine for therapy and diagnostics is necessary not only for students of veterinary medicine, but also for colleagues involved in terrain practice in the ambulances and clinics. Special part is elaboration and application of ultrasound for diagnostic purposes in veterinary medicine. Today, all around the world the ultrasound is widely used in clinical diagnostics in veterinary practice. Methods and techniques for use of ultrasound are always improving. In therapeutic purpose it is common to use continuous ultrasound, but in diagnostics the only solution is the impulse technique. Student would be also introduced with principles of work and diagnostic application of computer tomography (CT) and magnetic resonance (MR). On this way, the student after successful passing of the exam would be educated for application of diagnostic imaging techniques for diagnostic and therapeutic purposes in veterinary medicine. ***Practicals*** within course Diagnostic imaging have aim to introduce the students with basic conditions essential for an radiology cabinet, X ray devices and their parts (graphic-scopic), explanation of basic principles of X ray image analysis, technique for making X ray films, analysis of organic systems with use of radiology techniques, application of contrast media (positive and negative). Also, the students would be introduced with basic principles of work and application of physiotherapy and ultrasonography devices in therapeutic and diagnostic purpose. The students would have ability to work with and to analyze radiograms, in groups, for every organic system separately.

Contents

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
I	**BASIC RADIOLOGY**	**4 lessons**
1	INTRODUCTION	Importance of radiology in veterinary medicine. Historical development of veterinary radiology. X ray cabinet, X ray device and its parts and way of work.
2	X RAYS	Nature and formation of X rays. Features of X rays.
3	RADIOLOGY TECHNIQUE	Radiology technique. Basis of X ray image. Basis of radiology diagnostics.
4	ELEMENTS OF RADIOLOGICAL PATHOLOGY	Radiological techniques of examination. Natural and artificial contrast in radiology diagnostics.
II	**SPECIAL RADIOLOGY**	**11 lessons**
5	DIGESTIVE TRACT	Examination methodology. Topographic anatomy and pathology of digestive tract.
6	RESPIRATORY AND CARDIOVASCULARY SYSTEM	Radiological diagnostics of the respiratory and cardiovascular system.
7	UROGENTIAL SYSTEM	Radiological diagnostics of the urogenital system and diagnostics

		of early and late pregnancy.
8	SKELETAL SYSTEM	Radiological diagnostics of the skeletal system.
9	FORENSIC RADIOLOGICAL DIAGNOSTICS	Forensic radiological diagnostics of diseases in young animals and herd diseases.
10	PHYSIOTHERAPY	Principles of the physical diagnostics and therapy. Development and features of the physical techniques for therapy in veterinary medicine.
11	ELECTROTHERAPY AND ELECTRODIAGNOSTICS	Principles and features of therapeutic techniques of electrotherapy and electrodiagnostics.
12	PHOTOTHERAPY	Principles and features of phototherapeutic techniques.
13	THERMOTHERAPY	Principles and features of thermotherapeutic techniques.
14	HIDRO-, MASOTHERAPY	Principles and features of hydro- and masotherapeutic techniques.
15	ULTRASOUND, COMPUTER TOMOGRAPHY AND MAGNETIC RESONANCE	Ultrasonotherapy and ultrasonic diagnostics, diagnostic tomography and use of magnetic resonance in diagnostic purposes.

PRACTICALS

No of lessons	***Teaching unit***	***Contents of teaching unit***
1-2	X ray device and accessory parts	Main conditions for work and functioning of X ray cabinet. Basic parts of X ray device (X ray device and accessory parts).
3-4	Physical feature of X rays, projection effects, intensity of tissue shadows.	Main physical features of X rays (penetration, absorption and dispersion); projection effects in radiological diagnostics and shadow intensity in different kinds of tissues.
5-6	Scopy and graphy, X ray technique and X ray film and cassettes.	Radioscopy (enlightening); Radiography; Photochemical effect of X rays and compounds of X ray film and X ray cassettes.
7-8	Special radiological diagnostics, $BaSO_4$, passage and evacuation of the contrast medium	Native examination (graphy, scopy), and use of special radiological examination (use of positive and/or negative contrast media); Special examination of the digestive system with positive contrast medium and morpho-functional analysis of particular organs condition in the digestive tract. Passage and evacuation of ingest.
9-10	Diagnostic analysis of radiograms, principles for analysis and determination of symptoms and special examination of foreign bodies in ruminants.	Diagnostic analysis (radiogram, negatoscope, examination evidence, radiological finding and film library) and principles of analysis and interpretation of radiograms, as well as determination of radiological symptoms, i.e. changes; Technique of special examination of foreign body in ruminants (preparation of the patient and administration of pneumoperitoneum).
11-12	Respiratory tract	Basis of radiological diagnostics in respiratory organs (principles of diagnostics, radiological topography and physiology of respiratory organs); Radiological diagnostics of respiratory system diseases (diseases of upper airways and respiratory organs in thoracic cavity).
13-14	Cardiovascular system	Basis of radiological diagnostics of heart and blood vessels (principles of diagnostics, radiological topography and physiology of the heart and blood vessels); Radiological diagnostics of cardiovascular diseases (diseases of the heart and large blood vessels, pericardium and peripheral vasculature).
15-16	Urinary system	Basis of radiological diagnostics of urinary tract (principles of diagnostics, radiological topography and physiology of the urinary tract); Radiological diagnostics of urinary tract diseases.
17-18	Genital system	Basis of radiological diagnostics of genital system (principles of diagnostics, radiological topography and physiology of the genital system, diagnostics of pregnancy); Radiological diagnostics of genital system diseases.
19-22	Digestive tract	Basis of radiological diagnostics of digestive tract (principles of diagnostics, radiological topography and physiology of the digestive tract); Radiological diagnostics of digestive tract diseases (diseases of organs of head and neck and diseases of abdominal organs).
23-26	Practice of interpretation of radiograms	Practice with students, regular posting of the radiogram and interpretation of tissue shadows, writing radiology finding and making diagnosis for particular radiogram(s).
27-30	Skeletal system	Basis of radiological diagnostics of skeletal system (principles of diagnostics, radiological symptomatology of the skeletal diseases); Radiological diagnostics of osteopathies.

<table>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Practicals: 2 lessons a week (24 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive, introducing the student with basis of diagnostic imaging via theoretical presentation of the teaching material, discussion with the students about the certain topic, seminar works for improvement of knowledge and use of worldwide reference literature and internet.
Practicals: interactive, with groups, were the students are directly faced with a beat of diagnostics, connecting theory with practice, via interpretation of changes on the patient (organs) visible on the radiogram.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>10</td><td>14</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>12</td><td>18</td></tr>
<tr><td>Written assay</td><td>0</td><td>8</td></tr>
<tr><td>Periodical evaluations, (two theoretical)</td><td>8+10 (18)</td><td>10+12 (22)</td></tr>
<tr><td>Континуирана проверка (practical)</td><td>10</td><td>14</td></tr>
<tr><td>Final test</td><td>10</td><td>10</td></tr>
<tr><td>Final exam</td><td>0</td><td>24</td></tr>
<tr><td>Total</td><td>60</td><td>100</td></tr>
</table>
Scoring for complete final exam:
6 - 20 points
7 - 25 points
8 - 30 points
9 - 35 points
10 - 40 points
Condition criteria
- For being able to pass the final exam student has to gain up to 40 points from theory classes and practicals, the periodical evaluations and the final test.
- If the student does not gain minimum points oh the first periodical evaluation, he/she has no right on forward participation on other periodical evaluations.
- If the student did not pass the periodical evaluation, he/she has to go on final exam.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluations: written
First periodical evaluation: basic radiology;
Second periodical evaluation: special radiology (organic systems).

Final test: diagnosis of radiograms.
Final exam: written or oral.

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<tr><td>to 59</td><td>5</td></tr>
<tr><td>60-67</td><td>6</td></tr>
<tr><td>68-73</td><td>7</td></tr>
<tr><td>74-80</td><td>8</td></tr>
<tr><td>81-90</td><td>9</td></tr>
<tr><td>91-100</td><td>10</td></tr>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Branislav Petrovic, Anica Jankovic-Zagorcic: Veterinarska rentgenologija. Veterinarski fakultet Beograd, 1985.
2. Mensur Sehic: Opca rendgenologija u veterinarskoj medicini. Janko, Zagreb, 1995.
3. Mensur Sehic, Vladimir Butkovic, Damir Zubnic, Damir Stanin: Fizikalna medicina u terapiji i dijagnostici domacih zivotinja. Kratis, Zagreb, 1997.
4. Mensur Sehic: Klinicka rentgenologija u veterinarskoj praksi. Intergrafika, Zagreb, 2002.
5. Branislav Petrovic, Borislav Draganovic, Jovan Gligorijevic: Osnovi fizikalne medicine. Beograd, 1972.
6. Mensur Sehic: Osteoartropatije u domacih zivotinja. Zagreb, 2000.
7. Mensur Sehic: Bolesti organa i organskih sustava. Zagreb, 2004.
8. Mensur Sehic: Bolesti kosti, zglobova, tetiva i zivcanog sustava u domacih zivotinja. Zagreb, 2004.</td></tr>
</table>

Course	**CLINICAL BIOCHEMISTRY**	**2.0 credit points**
Шифра	**FVM 318**	
Year of study	**Third (III)**	
Semester	**Sixth (VI)**	
Total teaching lessons	**30 (15+15)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Velimir Stojkovski, PhD	
Realized by	prof. Velimir Stojkovski, PhD ass. Katerina Blagoevska, MSc	
Purpose and objectives of the course program	***Theory classes.*** Clinical biochemistry explores the chemical content of organisms during physiological and pathological processes in a living organism with the help of chemical and physic-chemical methods. As a complex discipline it explores the relations between physiological and pathological conditions, and chemical and cell content of liquids and tissues as well. Clinical biochemistry elaborates highly analytical diagnostic methods for examination of chemical and cell content of biological liquids and tissues. Main aim of the subject is to introduce the students with the basic clinical biochemistry diagnostic applied in veterinary medicine. Theoretical knowledge is evaluated with practical laboratory work. ***Practicals.*** During the practical part students get experience in sampling, analyzing and results interpretation. They get familiar with the basic analytical clinical biochemistry methods, which are of importance in veterinary medicine, as well as with the laboratory instruments. Students are required to work out short project summarizing their knowledge in clinical biochemistry diagnostic and present orally and discuss their findings.	

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents на наставната единица***
1	**General topics, methods and techniques in clinical biochemistry.**	The importance of clinical biochemistry in veterinary medicine. Methods' certainty. Standardization of clinical laboratory. Fast assays. Automatization in clinical biochemistry laboratory. Laboratory quality control. Referent values.
2	**Sampling for analyses**	Analytical procedures. Blood sampling. Mistakes from irregular sampling. Material storage. Sampling and analyses of urine. Biochemical analyses of urine. Blood in feces.
3	**Basic methods for material preparation for analyses**	Erythrocytes hemolysis. Deproteinization. Specificity of biochemical analyses in veterinary medicine. Screening programs in clinical-biochemistry diagnostic.
4	**Water, electrolytes and oligoelements**	Electrolytes (sodium, potassium, calcium, magnesium, chloride, phosphates). Oligoelements (iron, copper, zink). Clinical-biochemical correlations. Methods for electrolyte determination.
5	**Acid-base homeostasis**	Buffer systems. Alkalosis. Acidosis. Combined disturbances of acid-base homeostasis. Analyses of acid-base homeostasis parameters.
6	**Carbohydrates**	Carbohydrates. Specificity of carbohydrate metabolism in ruminants (glucose, glycogen and gluconeogenesis. Lipids. Acetonemia.
7	**Lipids**	Lipids. Specificity of lipid metabolism in ruminants. Total lipid. Triacylglycerols. Cholesterol. Clinical-biochemical correlations. Methods for determination of lipid profile.
8	**Proteins**	Proteins. Specificity of protein metabolism in ruminants. Total protein. Albumin. Fibrinogen. Diagnostic importance of serum protein electrophoresis. Clinical-biochemical correlations. Methods for determination of protein metabolism.
9	**Non nitrogen compounds**	Urea. Uric acid. Creatin and creatinine. Clinical-biochemical correlations. Methods for determination.
10	**Hemoproteins**	Disorders in heme synthesis. Determination of porphyrines in blood, urine and feces. Porphobilinogen. Hemoglobin. Hemoglobin derivates. Clinical-biochemical

		correlations. Methods for determination.
11	**Enzymes**	Enzymes important in diagnostics. Lactate dehydrogenase (LDH), sorbitol-dehydrogenase (SDH), glutamate dehydrogenase (GLDH), aspartate aminotransferase (AST), alanine aminotransferase (ALT), creatinine kinase (CK), gamma glutamyl transferase (γ-GT), alkaline phosphatase (AP), cholesterol esterase (CHE), lipase (LIPA), amylase (AMYL). Clinical-biochemical correlations. Methods for determination of enzyme activity.
12	**Hormones**	Principles of hormonal regulation. Hormone activity. Activation of adenylate cyclase system. Control of gene activity. Types of hormones. Hormones from the cortex of the adrenal gland. Hormones form the medulla of the adrenal gland. Sex hormones. Hormones of thyroid and parathyroid gland. Pancreas hormones. Clinical-biochemical correlations. Methods for laboratory diagnostic of hormonal secretion.
13	**Vitamins**	Vitamin A. Vitamin B_1. Vitamin B_2. Niacin. Vitamin B_6. Vitamin B_{12}. Vitamin C. Vitamin D. Vitamin E. Folic acid. Vitamin K. Pantothenic acid. Vitamin H. Clinical-biochemical correlations. Methods for vitamin determination.
14	**Liver function assays**	Bilirubin. Bile acids. Clinical-biochemical correlations. Methods for determination.
15	**Medicament influence upon laboratory results**	Biological effects of medicaments. Analytical interferences of medicaments.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1	Determination of electrolytes and oligoelements
2	Examination of acid-base homeostasis parameters
3	Glucose determination
4-5	Determination of total lipid, triglycerides and cholesterol
6-7	Determination of total protein, albumin and fibrinogen
8-9	Determination of urea, uric acid, creatine and creatinine
10	Determination of blood hemoproteins
11-13	Determination of LDH, SDH, GLDH, AST, ALT, CK, γ-GT, AP, CHE, LIPA and AMYL.
14	Determination of hormones and vitamins
15	Liver function assays

Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**6**	**10**
Attendance on practicals	**6**	**10**
Activity (knowledge) on practicals	**6**	**10**
Written assay	**6**	**10**
Periodical evaluations (two)	**18**	**30**
Final exam	**18**	**30**
Total:	**60**	**100**

Passing exam criteria:
- Attendance on the teaching is not scored if student was absent on more than 20% of lessons;
- Student who has gained up to 6 points from activity on Practicals is liberated from passing practical exam;
- Student can pass final exam само with passed practical exam, prepared written assay and minimum 42 points gained on any mode;
- Student is liberated from passing final exam with passed practical exam, prepared written

	assay, results shown on three periodical evaluations and minimum 61 points gained on any mode.
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation: General topics, methods and techniques in clinical biochemistry. Sampling for analyses. Basic methods for material preparation for analyses. Water, electrolytes and oligoelements. Acid-base homeostasis. Carbohydrates. Lipids. Second periodical evaluation: Non-nitrogen compounds. Hemoproteins. Enzymes. Hormones. Vitamins. Liver function assays. Medicament influence upon laboratory results **Final exam:** oral **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. Стојковски, В. (2001): *Ветеринарна клиничка биохемија*. Киро Дандаро, Битола. 2. J. Kaneko, J. Harvey, M. Bruss (2008): *Clinical biochemistry of domestic animals*.6^{th} *ed.* Academic press. 3. Other related literature, from internet etc.

Course	**INTERNAL DISEASES OF PET ANIMALS AND EQUINES**	**9.0 credit points**
Code	**FVM 411**	
Year of study	**Fourth** (**IV)**	
Semester	**Seventh and Eighth** (**VII and VIII**)	
Total teaching lessons	**150 (90+60)** **VII semester 2+4 (30+60)** **VIII semester 2+2 (30+30)**	
Course type	compulsory	
Prerequisities		
Author of the course program	ass. prof. Goran Nikolovski, PhD	
Realized by	ass. prof. Goran Nikolovski, PhD	
Purpose and objectives of the course program	**Definition of the course:** student gains knowledge of the internal diseases in the canine's, feline's and ungulate's organic systems, and refers to diseases of cardiovascular and respiratory system, gastrointestinal and liver diseases, urinary disorders and electrolyte imbalance, metabolic and neuromuscular diseases. **Position of the course in veterinary education:** through this course students are introduced with the diseases in domestic animals (dogs, cats, ungulates) which need extended knowledge of the veterinary medicine, application of new diagnostic technologies, as well as adequate approach in therapeutic protocols for various diseases. In the *theoretical part* student gains knowledge of the categorization of the diseases of the organic systems, their pathogenesis, description and methodological approach of the clinical sings, diagnostic procedures and differential diagnostics, application of the therapeutic protocols, prognosis and prevention of the diseases or their eradication. In the *practical part* student meets with clinical cases in the veterinary clinic, that are related with the material from the theoretical part, systematization of the information gained during the physical examination of the patient, diagnostic procedures and monitoring of the treatment. Also student are going to actively participate in patients treatment. **Relations of the course with previous and future education:** the subject is connected with other areas of the veterinary education such as: pathophisiology, patomorphology, diet, microbiology, parasitology, immunology and epizootiology. **General objectives of the course:** the general principle of this course is based on introducing the student with basically knowledge and practical experience that they need for prevention, treatment	

	and resolutions of health problems in animals, especially pets (dogs, cats, and equines).

THEORY CLASSES (VII Semester)

Редни број часови	***Teaching unit***	***Contents of teaching unit***
1-2	Congenital heart diseases, valvular disorders, Mitral dysplasia	Description of the frequency, clinical assessment, PDA, aortic and pulmonary stenosis.
3-4	Tricuspid dysplasia, acquired heart disease, bacterial endocarditic	
5-6	Endocarditis - chronic valvular disease, myocardial diseases, dilated cardiomyopathy in dogs	Frequency, clinical assessment, definition of the disease
7-8	Dilated cardiomyopathy in cats, cardiomyopathies in cats, pericardial effusion.	Definition, differences in clinical signs and prognosis of cadtiomyopathy in dogs and cats, grading of heart murmurs and treatment
9-10	Respiratory diseases, diseases of upper respiratory tract, rhinitis and neoplasia	Description of the common signs of respiratory diseases and clinical approach
11-12	Diseases of lower respiratory tract, cough, bronchopneumonia. Chronic bronchitis. Asthma in cats	Cough syndrome, clinical significance of cough
13-14	Eosinifilic lung infiltration, bronchiectasis. Inhalation of foreign body in trachea and bronchi.	Allergic base of the diseases, their solution.
15-16	Lung tumors. Collapse of trachea. Conditions that induce decreasing of lung capacity - effusions	Clinical description of dyspnea and tachypnea and present diseases.
17-18	Pyotorax, thoracic neoplasia, Pneumothorax Lung edema and emphysema, chronic alveolar emphysema	
19-20	Diseases of mouth, teeth and salivary glands.	Lesions of different etiology in the mouth, lesions of the tonsils.
21-22	Diseases of esophagus - oesophagitis, changes in patency. Diseases of the stomach: gastritis acuta, foreign bodies and volvulus – acute stomach dilatation. Gastritis chr.	
23-24	Peptic ulcer, obstruction of the stomach excretion. Diseases of small intestines. Food enteropathies, hemorrhagic gastroenteritis in dog, bowel obstruction, bowel inflammation.	Diarrhea with different etiology, diarrhea prevention, solving dehydration.
25-26	Fast bacterial multiplication in small intestines. Diseases of the large intestines, acute nonspecific colitis, plasmid-lymphatic colitis, noninflamatory colitis with diarrhea, colon obstruction, idiopathic megacolon, sinusitis paraanalis, colon and rectum neoplasia.	Differential diagnosis of small and large intestines.
27-28	Colic syndrome	Approach to patients with colic syndrome
29-30	Diseases of exocrine pancreas.	Principles of diagnosing pancreatic diseases.

THEORY CLASSES (VIII Semester)

No	***Teaching unit***	***Contents of teaching unit***
31-32	Inflammatory hepatobiliary diseases. Purulent and no purulent cholangitis/ cholangiohepatitis. Lymphocyte portal hepatitis. Obstruction of extrahepatic bile duct.	Diagnostic approach, description of clinical signs.
33-44	Congenital port systemic shunts. Chronic and idiopathic chronic hepatitis. Congenital Porto-vascular anomalies. Bile tract disorders.	
35-36	Urinary disorders, acute and chronic renal failure.	Methods of diagnosis, comparison of the clinical signs and results of treatment.
37-38	Glomerulonephropathies, cystic disorders, renal neoplasia.	
39-40	Infection of the urinary tract, urolythiasis.	Meeting with patients with urinary disorders, clinical approach.
41-42	Lower urinary tract disorders in cats.	

43-44	Urinary bladder neoplasia, Prostatis, benign prostatic hyperplasia.	
45-46	Endocrine disorders, pituitary gland disorders, D. insipidus. thyroidal disorders - Hypothyroidism	
47-48	Hyperthyroidism. Parathyroid disorders Hyperparathyroidism. Hyperparathyroidism.	
49-50	Adrenal glands. Hypoadrenocorticism-Addison's disease. Hyperadrenocorticism-Cushing disease	
51-52	Diabetes mellitus, neurology disorders	
53-54	Brain disorders-Hydrocephalus. Canine granulomatous meningoencephalomyelitis. Ischemic encephalopathy, head injury. Cranial nerves.	
55-56	Paralysis of n.facialis, trigeminus, Horner-syndrome. Spinal cord, lumbosacral stenosis, intervertebral diseases. Degenerative myelopathie, dyscospondilitis	
57-58	Epilepsy, Idiopathic epilepsy	
59-60	Myasthenia gravis	

PRACTICAL PART (VII Semester)

No of lessons	***Teaching unit and contents of teaching unit***
1-4	Approach to patients with heart disorders, basic diagnostic principles
5-8	Systematization of clinical signs in heart diseases and heart murmurs.
9-12	EKG procedures, VHS- measurements (vertebral heart score), therapy protocols in heart diseases. .
13-16	Case reports from students connected with heart diseases.
17-20	Respiratory diseases, approach to patients with respiratory diseases, basic diagnostic procedures.
21-24	Auscultation and recognition of respiratory murmurs
25-28	Interpretation of diagnostic procedures in respiratory diseases.
29-32	Case reports from students connected with respiratory diseases
33-36	Approach to patients with gastro-intestinal disorders, diagnostic procedures.
37-40	Systematization of clinical signs, determination of the degree of changes in the organs.
41-44	Fluid therapy, follow up patients with diarrhea
45-48	Case reports from students connected with gastro-intestinal diseases
49-52	Colic diseases in horses, systematization of clinical signs.
53-56	Colic diseases in horses, sounding the stomach, rectal exploration.
57-60	Case reports from students related with colic diseases in horses

PRACTICALS (VIII Semester)

No of lessons	***Teaching unit and contents of teaching unit***
1-2	Patients with liver diseases, systematization and diagnosis
3-4	Approach and treatment of patients with liver diseases.
5-6	Changes in exocrine pancreas and their spatial diet.
7-8	Patients with renal failures, assessment of the general condition, diagnostic approach
9-10	Therapy of renal failure, follow up patients condition.
11-12	Analyzing the results during therapy of renal failure.
13-14	Disorders of the urinary tracts, catheterization, punction of the urinary bladder.
15-16	Case reports from students connected with renal failure
17-18	Patients with endocrine disorders, following laboratory protocols.
19-20	Therapy protocols in endocrine diseases.
21-22	Neurological disorders, approach to patients with neurological disorders.
23-24	Examination of the reflexes associated with cranial nerves
25-26	Examination of the reflexes associated with the limbs
27-28	Approach to patients with epilepsy, following therapy protocols
29-30	Case reports from students related with neurologic diseases

Organization	Theory classes: 2 lessons a week (30 lessons) Practicals: VII Semester 4 lessons a week (60 lessons) VIII Semester 2 lessons a week (30 lessons)

<table>
<tr><td>Teaching methods</td><td>Theory classes: included lectures prepared by the students with interactive discussion
Practicals: practicals with groups of 8-10 students, working on certain clinical cases, preparation of case-report by the students.
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.
Scoring of the student’s activities:

<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>10</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>17</td><td>22</td></tr>
<tr><td>Written assay</td><td>0</td><td>8</td></tr>
<tr><td>Periodical evaluations (two)</td><td>10+10=20</td><td>20+20=40</td></tr>
<tr><td>Final test</td><td>5</td><td>5</td></tr>
<tr><td>Final exam</td><td>0</td><td>10</td></tr>
<tr><td>Total:</td><td>52</td><td>100</td></tr>
<tr><td>Complete final exam</td><td colspan="2">Grade mark / Points
Six 6 / 20
Seven 7/ 25
Eight 8 / 31
Nine 9 / 38
Ten 10 / 45</td></tr>
</table>
Condition criteria
• Student in order to gain right to take final exam, needs to score min 40 scores from theory classes and practicals, periodical evaluations and the final test. If the student fails in scoring the minimal points from the first periodical evaluation, he/she doesn't have right to take the second.
• The students that failed to pass the periodical evaluations can take the final exam (if they fulfill the conditions).
• The final exam contains written and oral part. According to the student's grade, they will gain appropriate scores.
• Final exam eligible students who have won at least 60 points based on theory classes and practicals, periodical evaluations and final test and want a higher grade than that which is predicted by the number of points they have got. Student will receive points only if his/her response is appropriate to the rating of which supports student.
• The final test is required and it takes place in a Clinic</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two)
Final exam: written or oral
Complete final exam: written and oral part

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<tr><td>to 59</td><td>5 (F)</td></tr>
<tr><td>60-67</td><td>6 (E)</td></tr>
<tr><td>68-75</td><td>7 (D)</td></tr>
<tr><td>76-85</td><td>8 (C)</td></tr>
<tr><td>86-95</td><td>9 (B)</td></tr>
<tr><td>95-100</td><td>10 (A)</td></tr>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>M. Schaer Clinical medicine of the dog and cat; Manson publishing 2003
R.W. Nelson, C.G. Couto, Small animal internal medicine, second edition Mosby Publishing</td></tr>
</table>

Course	**REPRODUCTION**	**16.0 credit points**
Code	**FVM 412**	
Year of study	**Fourth (IV)**	
Semester	**Seventh and Eighth (VII and VIII)**	
Total teaching lessons	**240 (105+135)** **VII semester 3+4 (45+60)** **VIII semester 4+5 (60+75)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Toni Dovenski, PhD	
Realized by	prof. Toni Dovenski, PhD ass. Branko Atanasov, MSc	
Purpose and objectives of the course program	***Theory classes*** in course **Reproduction** have aim to introduce the students with the main theoretical principles of reproduction in domestic animals: gynecology, obstetrics, sterility, artificial insemination, physiology and pathology present during gestatial and puerperal period in dam and fetus, main endocrine mechanisms which have control on reproduction, manipulative techniques, recent biotechnologies of assisted reproduction, andrology, mammary gland diseases, neonatal diseases. So, the future doctor of veterinary medicine would be able to become related with: knowledge for recognizing of indication for medical treatment during reproduction problems, sterility, pathological changes present during gestation; ability for advising and application of properly treatment in case of sterility; ability for using measures and interventions for improvement of productive and reproductive status of particular animal, as well as herds of farm animals. ***Practicals*** in course **Reproduction** have aim to introduce the students with: practical skills for diagnosis of reproduction conditions in domestic animals, most important interventions necessary for terrain practice in the field of reproduction, obstetrics and sterility in animals, use of proper therapy necessary for improvement of reproductive performance in both production and companion animals, artificial insemination and other biotechnologies of assisted reproduction in practice.	

THEORY CLASSES

Seventh (VII) semester

No of lessons	***Teaching unit***	***Contents of teaching unit***
1.	INTRODUCTION	Subject of study of reproduction
2-3.	ANATOMY OF FEMALE GENITAL ORGANS	ovary, oviduct, uterus, vagina and vulva
4-8.	PHYSIOLOGY OF FEMALE GENITAL ORGANS	reproduction maturity, sexual cycle, ovarian sexual cycle, mucosal sexual cycle, oviductal cycle, uteral cycle, changes in cervix, vaginal cycle, external cycle, estrus signs in mares, cows, ewes, does, sows, bitches and queens, end of estrus, breeding, conception, division of egg-cell, embryogenesis and fertility in domestic animals
9.	ANATOMY OF MALE GENITAL ORGANS	Testicles, ductus deferens, spermatic cord, vesicle glands, prostate, bulbourethral glands, scrotum, male copulatory organ
10-11.	PHYSIOLOGY OF MALE GENTIAL ORGANS	puberty in male animals, sexual cycle, function of testicles, spermatogenesis, endocrine function of testicles
12-18.	PHYSIOLOGY OF GRAVIDITY	**Fetus and fetal membranes**: fetal membranes, fetal fluids and fetal bloodstream. **Fetus growth and determinations of fetus' age.** **Implantation and position of the fetus in uterus**: **intrauterine** position of the fetus, delivery maturity of the fetus. **Dam in gravidity**: changes on **genital** organs, changes on ovaries, changes on oviducts, changes on uterus, changes on cervix, changes on vagina, gravidity duration. **Diagnostics of gravidity**: **gravidity signs** in general, diagnostics of gravidity with rectal examination, accessory techniques for detection of gravidity, **use of ultrasonography in veterinary gynecology**, diagnostics of gravidity in mares, laboratory techniques for detection of gravidity, diagnostics of gravidity in other animals.
19-22.	PHYSIOLOGY OF DELIVERY	Signs of delivery Delivery tract Delivery, dilatation stage, fetal expulsion stage, postpartum stage

		Nursery and dietetics of animals before and after delivery
23-25.	PHYSIOLOGY OF PUERPERIUM	physiological puerperium, involution of uterus
ENDOCRINOLY AND CONTROL OF REPRODUCTION		
26.	INTRODUCTION	Actual condition with use of biotechnical methods. Factors which have impact on fertility in male and female reproductive animals. Increasing fertility in female farm animals.
27.	CONTROL OF THE START OF PUBERTY	Endocrine control of puberty. Practical implication of early puberty. Development of biotechnical methods of control of puberty and their use.
28-30.	CONTROLED OESTRUS AND OVULATION	Estrus and its detection. Estral cycle. Endocrine control of estral cycle. Advantages of estrus control. Biotechnical method ant their use in control of estrus.
31.	CONTROL OF SEASONAL REPRODUCTION	Seasonal reproduction and endocrine control. Development and use of seasonal reproduction control methods.
32.	ARTIFITIAL INSEMINATION (AI)	Advantages in use of AI. Improvement and development of AI techniques and technology. Detection of sex in sperm cells. Endocrine control of spermatogenesis.
33.	CONTROL OF MULTIPLE DELIVERIES AND LITTER SIZE	Advantages and measures for control. Development of biotechnical methods.
34.	CONTROL OF GRAVIDITY	Endocrine control of gravidity. Control measures advantages. Factors with impact on conception. Gravidity testing techniques.
35.	CONTROL OF PARTUS	Endocrine control of partus. Control measures advantages. Development and usage of gravidity control measures.
36.	CONTROL OF POST-PARTUM PERIOD	Endocrine control of post-partum period. Factors with impact on post-partum ovarian activity. . Development and usage of post-partum period control measures.
37-38.	EMBRYOTRANSPHER	Advantages of using the embryotranspher. Embryotranspher technique development. Practical application of embryotranspher.
39.	PRODUCTION OF EMBRYOS IN VITRO	Advantages of production of embryos in vitro. Development of technology. Embryos produced in vitro for scientific and commercial purpose. Future directions for development of technology.
40.	CLONING TECHNOLOGY	Practical implications of the technology. Development and application of cloning technology.
41.	PRODUCTION OF TRANSGENIC ANIMALS	Usage and implications of the technology. Producing of transgenic animals.
42.	SUPRESSION OF THE REPRODUCTIVE ACTIVITY	Advantages of the technology. Development and usage of the technology.
43.	STRESS AND REPRODUCTION	Endocrine control of the stress.
44-45.	LACTATION	Endocrine control of the lactation. Usage of lactation control techniques

Eighth (VIII) semester

No of lessons	***Teaching unit***	***Contents of teaching unit***
1-6.	PATHOLOGY OF GRAVIDITY	**Pathological conditions of placenta.** Fetal membranes hydrops, inflammation of placenta. **Pathological condtions of fetus.** Death of fetus during gravidity, mummification of fetus, maceration of fetus, rot of fetus, abortion. **Pathological conditions of gravidity related with genital organs:** abnormal oedema during gravidity, gravide uterus bleeding, pathological conditions in vagina, vaginitis, pyometra, invagination and prolapse of vaginal vault, gravide uterus dislocation, gravide uterus torsion, uteral hernias
7-16.	PATHOLOGY OF DELIVERY	**Extraction of fetus per force.** **Reposition techniques of irregular position of the fetus.** **Embryothomy** **Gynecology surgical procedures in abdomen:** laparothomy, Caesarean section. **Irregular and pathological conditions of fetus compromising the delivery:** irregular positions of fetus.

		Difficult deliveries and perinatal mortality **Injuries of genital organs and their environment during delivery:** injuries of the uterus, cervix, vagina and vulva, complete perineal rapture **Injuries of pelvic bone:** fracture of pelvic symphisis, fractures of pelvic bones, distortion and luxation of the sacroiliac wrist.
17-22.	PATHOLOGY OF PUERPERIUM	**Prolapse and invagination of uterus** **Retention of placenta** **Metabolic disorders during gravidity and puerperium:** disorders of mineral metabolism, postpartal paraplegia, puerperal paresis, tetania, acetonemia **MMA syndrome** **Puerperal infections:** local puerperal infections, puerperal inflammation of vulva, vaginal vestibule and vagina, puerperal inflammation of uterus, general puerperal infection, puerperal sepsis, puerperal pyemia, puerperal tetanus, uteral ulcer
23-26.	NEONATAL DISEASES	**Diseases of neonates:** embryogenesis disorders, malformations of trunk and limbs, organic malformations, lack of annus, navel hernia **Organic and deficiency diseases:** birth trauma in neonates, asfixion of neonate, meconium retention, avitaminoses, neonatal jaundice **Infectious diseases in neonates:** navel infections, septicemic diseases in suckling animals.
27-36	ARTIFITIAL INSEMINATION (AI)	**History and significance of AI.** **Sperm:** sperm contains, morphological and histological features of sperm cells, impact of environment on sperm. **AI procedures in animals** **Technology of AI:** production of ejaculate, adspection, preparation and transport of sperm, deep freezing of sperm. **AI in cows.** **AI in ewes.** **AI in does.** **AI in sows.** **AI in mares.** **AI in companion animals.**
37-40	MAMMARY GLAND DISEASES	**Inflammation of mammary gland, etiopathogenesis.** **Clinical symptoms of mastitis.** **Clinical examination of udder.** **Bacteriological diagnostics of mastitis.** **Treatment of mastitis during drying period in cows.** **Latent mastitis.** **Economic loss from mastitis.** **Inflammation of mammary gland in ewes and does:** gangrenous mastitis in sheep, brucellosis mastitis, mastitis in goats. **Non-infectious diseases of mammary gland:** physiological swelling of mammary gland. **Papylomatosis of udder.** **Congestion of udder.** **Nipple diseases:** inflammation of nipples, stenosis and shortening of mammary channel, injuries of nipples, milk incontinention.
41-42	INHERENT INFERTILITY IN COWS	Ovarian hypoplasia, intersexuality and freemartinism and White heifers dissease
43-46	ACQUIRED INFERTILITY IN COWS	Sterility in cows: acquired anatomical abnormalities (tearing of perineum, tumours of genital organs, urovagina, vaginal cysts, anoestrus, silent oestrus (suboestrus, hypoestria, hypoerosia), disorders of ovulations, anovulation, ovarian cysts (cysta ovaria), oestrus during gravidity (superoestrus), nymphomania (hypersexualismus), chronical endometritis, supecifical infections, infectious sterility.
47-48	EXTRAGENITAL STERILITY	Weak estrus detection. Embryonic mortality. Detection of insemination term.
49	INFERTILITY IN EWES AND DOES	Reproductive indicators. Structural malformations. Functional disorders.
50	INFERTILITY IN SOWS	Oestrus absence (anestria, suboestus). Ovulation problems and ovarial cysts. Failed gestation.
51	STERILITY IN MALE ANIMALS	Mating incapacity. Impotentio coeundi: inherent impotency, testical hypoplasia, hermaphroditism, cryptorchism, spermatokele, preputial diverticle.
52	STERILITY IN MALE ANIMALS	Mating incapacity (somatic impotency). Impotentio generandi: penis' tumours, phymosis, paraphymosis, reflex, hormonal, senile and nutriritve impotency.

53-58	INFERTILITY IN MARES	Anatomical factors of infertility, Functional factors of infertility, Oestrus absence, Anovulatiod and delayed ovulation, Twin ovulation and embryonic mortality, endometrioses. Infectious causes of infertility, Chronical endometritis, Contagious Equine Metritis (CEM), infective abortions in mares, Genital measles in equines (exanthema coitale vesiculosum).
59-60	INFERTILITY IN CARNIVORES	Functional infertility, Delayed puberty, Abortion and absorption of fetus, Infective infertility, Metritis and pyrometer.

PRACTICALS

Seventh (VII) semester

No of lessons	***Teaching unit and contents of teaching unit***
1-6	Anatomy of female and male genital organs
7-18	Gynecological examination of cows
19-20	Gynecological examination of mares
21-22	Gynecological examination of carnivores
23-24	Gynecological examination of small ruminants
25-30	Ultrasonographic gynecological examination in large animals
31-32	Ultrasonographic gynecological examination in small animals
33-38	Diagnostics of gravidity in cows
39-40	Diagnostics of gravidity in mares
41-42	Diagnostics of gravidity in small animals
43-44	Laboratory techniques for diagnostics of gravidity
45-48	Preparation of dam for delivery
49-50	Acceptation, handling and nursing of the neonate
51-52	Basic gynecological surgery procedures
53-56	Usage of biotechnical methods for control of the estrus and ovulation
57-58	Usage of biotechnical methods for control of the partus and lactation
59-60	Techniques for making superovulation, usage of ET and IVF

Eighth (VIII) semester

No of lessons	***Teaching unit and contents of teaching unit***
1-3	Preparation of dam for delivery
4-7	Obstetric instruments and preparation of the obstetrician
8-11	Reposition of irregular positions, assistance during delivery
12-15	Dam surgery
16-19	Aid techniques, equipment and procedures in uteral torsion
20-23	Clinical treatment of the dam during puerperium
24-27	Semen collection in breeding animals: preparation of artificial vagina, electroejaculation and other techniques Земање семе од домашните расподници:
28-30	Examination and evaluation of the sperm: macro- and microscopic Determination of sperm cells concentration
31-33	Techniques for determination of morphological features of the sperm cells; supravital staining of sperm
34-36	Handling with deep frozen sperm and AI instruments in cows
37-40	AI of cows
41-42	AI of small ruminants
43-44	AI of sows
45-46	AI of carnivores
47-48	AI of other species
49-52	Examination of mammary gland. Diagnostics of clinical and subclinical mastitis
53-60	Diagnostics, therapy and prevention of sterility in cows
61-62	Detection and supression of forms of extragenital sterility
63-64	Diagnostics and threatment of sterility in ewes and does
65-66	Diagnostics and threatment of sterility in sows
67-68	Diagnostics and threatment of sterility in male animals
69-72	Diagnostics and threatment of sterility in mares

73-75	Diagnostics and threatment of sterility in carnivores

Organization	**Seventh (VII)** Theory classes: 3 lessons a week (45 lessons) Practicals: 4 lessons a week (60 lessons) **Eighth (VIII)** Theory classes: 4 lessons a week (60 lessons) Practicals: 5 lessons a week (75 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: terrain and laboratory practicals and other ways of work with smaller groups (5-8 students). Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** ***Activity type*** / ***Points*** (***minimum*** – ***maximum***): **Attendance on theory classes: 5 – 10** **Attendance and activity (knowledge) on practicals: 10 – 20** **Periodical evaluations: 10 – 20** **Final exam: 26 – 50** **Total: 51 – 100** **Prerequisite criteria:** For being able to pass the final exam student has to gain up to 40 points from theory classes and practicals and the periodical evaluations. If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation: Физиологија на репродукција Second periodical evaluation: Ендокринологија и контрола на размножување **Final exam:** oral **Complete final exam:** oral + written (includes one periodical evaluation) **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	Мицковски Г.: Физиологија и патологија на репродукцијата. Ветеринарен Институт-Ветеринарен факултет, 2000, Скопје Поповски К., К'нчев Љ.: Ендокринологија на репродукцијата. Ветеринарен Институт-Ветеринарен факултет, 1998, Скопје

Course	**GENERAL SURGERY WITH ANESTHESIOLOGY**	**6.0 credit points**
Code	**FVM 413**	
Year of study	**Fourth (IV)**	
Semester	**Seventh (VII)**	
Total teaching lessons	**90 (45+45)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Plamen Trojachanec, PhD	
Realized by	prof. Plamen Trojachanec, PhD ass. Ksenija Ilievska, MSc	
Purpose and objectives of	**A place that course occupies in veterinary education**: This course should stimulate the students for application of previously acquired knowledge of anatomy, pathology, pathophysiology	

the course program	and pharmacology for diagnosis of surgical diseases, handling the surgical patients and providing suitable anesthesia and intensive care for critical patients. **Aim of the course:** To enable the student for independent work in daily animal practices. Thereby, student examines the animals, establishes diagnosis and performs conservative and operative treatment of surgical and orthopedic diseases. Particular attention is given to the practical side of the anesthesiology and intensive care. **Relations of the course with previous and future education:** The course is closely related with all preclinical courses, especially Anatomy of animals, Pathology and Microbiology and represents a requirement for dealing with clinical patients.

Contents

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
General Surgery (29 lessons)		
1	Introduction to surgery and surgical nomenclatures	Definition and significance of surgery with basic surgical nomenclature
2	Mechanisms and effects (influence) of trauma	Definition, causes and influence of trauma on tissue
3	Local tissue response to trauma or surgery	Pathophysiological process of tissue and organ reaction during traumatic and surgical injuries
4-5	Wound and traumatic injuries	Treatment and complications of traumatic injuries
6-7	Wound healing	Wound healing physiology and treatment
8-9	General operative procedures	General techniques for tissue and instruments handling
10-11	Principles of aseptic surgery	Definition of surgical asepsis and antisepsis
12-13	Celiotomy	Indication and techniques for celiotomy
14	Bleeding and hemostasis	Definition, role and surgical techniques for hemostasis
15-16	Preoperative assessment of surgical patients and monitoring during surgery	Complete physical examination of the patient and significance of monitoring
17-18	Postoperative care, wound infection and antimicrobial prophylaxis	Postoperative monitoring and complications in surgical patient
19	Nutritional management of the patient	Methods of feeding tube placement
20-21	Disease of the ear and intengumentary system	Management of specific skin disease, general principles and surgical treatment of otitis
22-24	Principle of plastic and reconstructive surgery	General principles and techniques for reconstructive surgery and suture placement
25	Hernias	Definition and classification of hernia and basic reparation techniques
26	Peritonitis	Pathophisiology and treatment of peritonitis
27-29	Basic surgical oncology procedures	General techniques in small animal oncology

No of lessons	**Fundamentals of anesthesiology (17 lessons)**
1	General anesthetic principles
2-3	Analgesia
4	Anesthetic management
5	Anesthetic monitoring
6	Premedication
7-8	General anesthesia
9	Inhalation anesthesia
10	Anesthetic systems and equipment
11	Peri-operative anesthetic complications and emergency situations
12	Specific anesthetic protocols

13-14	Local anesthesia
15	Fluid therapy
16	CPR
17	Euthanasia

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1-2	Methods of physical and chemical patient restraint
3-6	Basic clinical procedures
7-9	Implementation of asepsis and antisepsis in surgery
10-11	Preoperative examination and patient evaluation
12-15	Desmiurghy
16-19	Introduction and handling with surgical instruments
20-21	Basic suture materials
22-31	Tissue suture placement
32-38	Treatment of surgical patient
39-40	Pain control
41-44	Anesthesiology – practical lectures

<table>
<tr><td>Organization</td><td>Theory classes: 3 lessons a week (45 lessons)
Practicals: 3 lessons a week (45 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Course methodology: Introduction the student with fundamentals of veterinary surgery and anesthesiology through interactive teaching based on interactive theoretical exposure of the material, discussions and preparation of seminars that encourage independent work of students, individually or in groups. Practicals comprise of work in a smaller groups by exposing the fundamentals of anesthesiology and surgical treatment of patients in order to gain practical knowledge of basic surgical methods and techniques.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>2.5</td><td>5</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>5</td><td>10</td></tr>
<tr><td>Test on General surgery</td><td>24</td><td>40</td></tr>
<tr><td>Test on Anesthesiology</td><td>9</td><td>15</td></tr>
<tr><td>Practical exam</td><td>18</td><td>30</td></tr>
<tr><td>Total:</td><td>58.5</td><td>100</td></tr>
<tr><td>Written assay (optional)</td><td>0</td><td>5</td></tr>
<tr><td>Final exam (optional)</td><td>33</td><td>55</td></tr>
</table></td></tr>
<tr><td>Evaluation of knowledge</td><td>Test on general surgery participates with 40% in grade formation. (Rule: it will be held one week after the lectures are finished). Test with less than 50% correct answers will not be considered in further calculation.
Test on anesthesiology participates with 15% of total points. (Rule – it will be held one week after the block lectures of Anesthesiology). Test with less than 50% correct answers will not be considered in further calculation.
The practical exam participates with 30% of total points and represents a requirement in final grade formation.
Attendance at theory classes and practicals participates with 15%. Students, who attend less than 30% of total theoretical teaching, will not receive any points. Attendance between 30-60% brings 2.5 points, while the attendance in more than 60% of theoretical teaching carries 5 points. Students that attended on less than 40% of Practicals will not receive any points. Attendance between 40-70% at Practicals carries 5 points, while attendance in more than 70% brings 10 points.
The students have an opportunity to prepare a written assay, which brings up to 5 points. The grade is obtained for each of the exam parts, according to the criteria listed on the test. To calculate the total points from each test, the grade from the tests is multiplied with the percentage of participation of the exam part and is divided with 10. Final grade is formed as the sum of the points from the tests, points from the practical exam and points gained from the attendance of theory classes and practicals.</td></tr>
</table>

	Students who have not received a positive evaluation from both tests or they are not satisfied with their results, can take a final exam. In this case, previously gained points are not included in the calculation. The tests are performed at precisely given date and are required for all the students. The tests can be taken up to two times after which the course is re-enrolled. Terms for the exam will be announced at the beginning of the test sessions. **Final grade mark forming criteria:** ***Points*** / ***Grade mark*** **до 57** / **5 (F)** **58-62** / **6 (E)** **63-72** / **7 (D)** **73-85** / **8 (C)** **86-95** / **9 (B)** **96-100** / **10 (A)**
Basic teaching aids	**Required:** Тројачанец П., *Прирачник по општа хирургија*, 2005, Факултет за Ветеринарна медицина Скопје; Тројачанец П., *Основи на ветеринарна хирургија*, 2005, Факултет за Ветеринарна медицина Скопје; Тројачанец П., Илиевска К., 2009, Основи на ветеринарната анестезиологија **Recommended**: Slatter Douglas, *Textbook of small animal surgery* 2nd edtition, 2002 Sounders; Fossum Theresa W., *Small animal surgery* 2nd ed., 2002 Mosby; Thurmon J.C., Tranquilli W.J., Benson G.J.Lumb & Jones *Veterinary Anesthesia* 3rd edition. 1996, Williams &Wilkins; Perimatei D., Flo G., DeCamp C. *Small animal orthopedics and fracture repair* 2006 Saunders; Harari J. *Small animal surgery* 1996 Williams & Wilkins; Swaim S., Henderson R. Small animal wound management 1990 Williams & Wilkins; Vasić J., *Osnovi veterinarske hirurgije* 1996, Budić Z., Cvetković Z., Petković B. *Anestezija malih životinja* 1997 Prosveta; Veterinarski fakultet Beograd; Vjekoslav Srebočan, Hrvoje Gomerčić *Veterinarski priručnik*, četvrto dopunjeno izdanje, Zagreb; Matičić D., Vnuk D. Veterinarska kirurgija i anesteziologija 2009, Medicinska naklada, Zagreb.

Course	**INFECTIOUS DISEASES OF DOMESTIC ANIMALS**	**10.0 credit points**
Code	**FVM 414**	
Year of study	**Fourth (IV)**	
Semester	**Seventh and Eighth (VII and VIII)**	
Total teaching lessons	**135 (75+60)** **VII semester (45+30)** **VIII semester (30+30)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Ivancho Naletoski, PhD	
Realized by	prof. Slavcho Mrenoshki, PhD ass. Kiril Krstevski, MSs	
Purpose and objectives of the course program	Introducing the students with characteristics of the infectious diseases, and the techniques for their diagnostics and control.	

No	***Teaching unit***	***Lessons***
1	Foot and mouth disaese, Swine vesicular disease, Vesicular stomatits, Vesicular exanthema of swine, Bovine papular stomatitis *Video presentation: Foot and mouth disease*	4
2	Rinderpest, African horse sickness, Bluetongue disease, Bovine malignant catarrhal fever *Video presentation: Rinderpest and other erosive diseases* *Video presentation: Attention - Bluetongue*	4
3	Measles in all species, Pseudocowpox, Lumpy skin disease, Ecthyma contagiosum in sheep and goats (Orf), Bovine mammillitis *Video presentation: Sheep pox and goat pox*	4
4	Classical swine fever, African swine fever *Video presentation: Swine fever* *Video presentation: African swine fever*	4
5	Q fever, Rift Valley fever, Heartwater	4
6	Morbus maculosus in cattle, Bovine ephemeral fever, Infectious keratoconjunctivitis (Pink eye) in cattle, sheep and goat	4

7	Transmissible gastroenteritis in swine, Porcine epidemic diarrhea, Swine dysentery (Bloody scours) *Video presentation: Infectious diseases in swine*	4
8	Bovine viral diarrhea and mucosal disease in cattle, Contagious bovine pleuropneumonia, Contagious caprine pleuropneumonia, Contagious pleuropneumonia in sheep and horse *Video presentation: Contagious bovine pleuropneumonia*	4
9	Swine pleuropneumonia caused with Actynobacillus and Mycoplasma	4
10	Equine influenza, Bovine parainfluenza, Swine influenza, Adenoviral respiratory infections, Rhinoviral infections, Reoviral infections, Pneumococcoses	4
11	Infectious bovine rinotracheitis / infectious pustular vulvovaginitis (IBR/IPV), Equine coital exanthema, Equine infectious anemia *Video presentation: Equine infectious anemia*	4
12	Aujeszky's disease, Infectious porcine encephalomyelitis *Video presentation: Infectious diseases in swine*	4
13	Bovine spongiform encephalopathy, Scrapie, Looping ill in sheep, Rubies *Video presentation: Bovine spongiform encephalopathy* *Video presentation: Scrapie - clinical sign in sheep and goats* *Video presentation: Rubies*	4
14	Anthrax, Pasteurellosis, Atrophic rhinitis in pigs, Leptospyrosis, Salmonellosis, Lysteriosis	4
15	Erysipelas in swine, Glässer disease in swine	4
16	E. coli infection in calves and piglets, Coli enterotoxemia, Edema disease in swine	2
17	Clostridial diseases: gas-gangrene group and toxemias (enterotoxemias, tetanus and botulism)	2
18	Glanders, Epizootic lymphangitis, Melioidosis, Ulcerative lymphangitis in horse, Ulcerative lymhangitis in cattle	2
19	Tuberculosis, Paratuberculosis (Johne's disease), Pseudotuberculosis	2
20	Actynomycosis, Botriomycosis	2
21	Brucellosis in cattle, sheep/goat, swine, horse, carnivores, poultry, humans	2
22	Ovine foot rot, Necrobacillosis	2
23	Mastitis, Contagious agalactia in sheep and goat, Gangrenous mastitis in sheep and goat	2
24	Porcine reproductive and respiratory syndrome, Parvoviral infection in swine *Video presentation: Infectious diseases in swine*	2
25	Contagious (Campylobacter) abortion in sheep and cattle, Enzootic abortion in ewes (chlamydial infection)	2
26	Mycoplasmosis in cattle, swine, sheep/goat, horse, carnivores and other animals	2
27	Maedi/Visna and Smaedi infection in sheep and goat	2
28	Leucosis (cattle, sheep, horse, swine, cat, dog and other species)	2
29	Papillomatosis in cattle, goat, rabbit, horse, swine, dog and humans. Genital tumor in dog.	2
30	Mycoses: Aspergillosis, Candydiasis, Coccidiomycosis, Skin mycoses (dermatomycoses)	2
	TOTAL:	90

Organization	VII semester: Theory classes - 4 lessons a week; Practicals - 2 lessons a week VIII semester: Theory classes - 2 lessons a week; Practicals - 2 lessons a week
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups. Video presentations and discussion with active participation of the students. Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	**Points**	
	minimum	**maximum**
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on practicals	**23**	**30**
Written assay	**0**	**5**
Periodical evaluations (two)	**10**	**20**
Final exam	**15**	**30**
Complete final exam*	***Grade mark***	***Points***

		Six (6)	**20**
		Seven (7)	**25**
		Eight (8)	**30**
		Nine (9)	**35**
		Ten (10)	**43**
	Total:	**60**	**100**

Prerequisite criteria: For being able to pass the final exam student has to gain up to 40 points from theory classes and practicals and the two periodical evaluations.
*If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.

Evaluation of knowledge

Periodical evaluation (two): written
Final exam: written-oral
Complete final exam: oral + written

Final grade mark forming criteria:

Points	*Grade mark*
to 59	**5 (F)**
60-69	**6 (E)**
70-77	**7 (D)**
78-86	**8 (C)**
87-93	**9 (B)**
94-100	**10 (A)**

Basic teaching aids

1. Djordje Panjevic: Zarazne bolesti zivotinja – virusne etiologije. Veterinarski fakultet Beograd, 1989.
2. Djordje Panjevic: Zarazne bolesti zivotinja – bakterijske etiologije. Veterinarski fakultet Beograd, 1989.
3. Djordje Panjevic: Zaraze domacih zivotinja – opsti deo. Naucna knjiga, Beograd, 1986.
4. Slavko Cvetnic: Virusne bolesti zivotinja, Stvarnost - JAZU, Zagreb, 1983.

Internet pages:

5. http://www.cfsph.iastate.edu/DiseaseInfo/index.php
6. Merck Veterinary Manual (http://www.merckvetmanual.com/mvm/index.jsp)
7. DEFRA (http://www.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/index.htm#a)
8. FAO (www.fao.org)
9. Terrestrial Animal Health Code 2010 (http://www.oie.int/eng/normes/mcode/en_sommaire.htm)
10. Manual of Diagnostic Tests and Vaccines for Terrestrial Animals 2010
11. (http://www.oie.int/eng/normes/mmanual/a_summry.htm)
12. Wikipedia (http://en.wikipedia.org/)

Course	**INTERNAL DISEASES OF FARM ANIMALS**	**11.0 credit points**
Code	**FVM 415**	
Year of study	**Fourth (IV)**	
Semester	**Seventh and Eighth (VII and VIII)**	
Total teaching lessons	**165 (90+75)** **VII semester 3+3(45+45)** **VIII semester 2+3(30+45)**	
Course type	Compulsory	
Prerequisities		
Authors of the course program	prof. Dine Mitrov, PhD ass. Igor Dzhadzhovski, MSc	
Realized by	prof. Dine Mitrov, PhD prof. Dino Chrchev, PhD ass. Igor Dzhadzhovski, MSc	
Purpose and objectives of the course program	***Theory classes and practicals*** of the course Internal diseases of farm animals include disciplines from several fields of internal medicine of farm animals.	

Theory classes

Internal diseases of cattle, sheep and goat (75 lessons):

No	*Teaching unit*	*Lessons*
1.	Introduction, diseases of oral cavity, tongue, salival glands, pharynx, teeth and oesophagus. Disease of preventricles: Introduction, classification. Simple indigestion. Acid indigestion. Parakerathosis, Alkaline indigestion. Putrification of ruminal content.	6
2.	Traumatic indigestion. Ruminal meteorism. Omasum paresis. Vagal indigestion. Other diseases of preventricles. Diseases of abomasum.	6
3.	Intestinal inflammation. Winter dysentery. Neonatal calf diarrhea. Alimentary diarrhea in calves. Dislocation of abomasum. Intestinal intussusception. Intestinal incarceration and strangulation. Intestinal volvulus. Dilatation and torsion of caecum. Peritonitis.	6
4.	Diseases of liver. Diseases of pancreas.	2
5.	Diseases of respiratory organs: Nasal cavity, sinuses, larynx. Pulmonal congestion and edema. Pneumonia (bronchopneumonia, gangrenous, purulent, embolic and mycotic pneumonia).	4
6.	Enzootic pneumonia in calves. Viral pneumonia in calves and heifers. Diseases of cardiovascular system in ruminants	2
7.	Diseases of urinary system - nephrosis, renal amyloidosis, nephritis (acute, chronical, purulent), bacterial pyelonephritis. Cystitis, bladder paralysis, chronical vesicular hemathuria, urolythiasis.	4
8.	Diseases of blood and hematopoietic organs. Hemorrhagic diathesis. Diseases of spleen.	2
9.	Diseases of CNS	4
10.	Metabolic disorders (metabolic osteopathy, rickets, osteomalacia). Ketosis.	4
11.	Puerperal paresis. Atypical puerperal paresis. Tetany. Microelement deficiency. Rickets. Osteomalacia. Alotriophagia.	4
12.	Hypovitaminoses and avitaminoses. Disorders of energetic metabolism.	2
13.	Diseases of locomotory system. Diseases of skin.	2
14.	General about intoxications. Intoxication with copper, zinc, mercury, lead and molybdenum. Intoxication with arsenic, selenium, caustic bases, table salt. Intoxication with urea, phosphorus, sulfur, chlorine, chlorinated hydrocarbons	2
15.	Intoxication with herbal poisons. Mycotoxicoses. Botulism. Intoxication with animal poisons.	5

Internal diseases in swine (20 lessons):

16.	Diseases of digestive organs. Diseases of oral cavity, pharynx. Obstruction of oesophagus. Gastro-intestinal catarrhs. Gastric ulcer. Colibacillosis in piglets. Edema disease. Contagious gastroenteritis. Dysentery. Dislocation of intestine. Diseases of liver.	6
17.	Disease of respiratory organs: Rhinitis, atrophic rhinitis. Bronchitis. Pneumonia and pneumomycosis.	2
18.	Diseases of cardiovascular organs: Cardiac anomalies, heart stroke (heart attack).	2
19.	Diseases of urinary organs: Nephritis. Pyelonephritis. Cystitis. Urolythiasis.	2
20.	Diseases of blood and hematopoietic organs: Anemia. Hemoglobinemia, Hemoglobinuria.	2
21.	Diseases of CNS: Sunstroke and heat stroke. Meningitis. Encephalitis. Paresis and paralysis. Otitis interna.	2
22.	Disorders in metabolism of macro- and microelements. Hypo- and avitaminosis. Ketosis. Hypoglycemia.	2
23.	Diseases of locomotory organs: Rheumatism. Myopathies. Inflammation of joints and synovial membranes. Disorders of skin: exemas, dermatitis. Exanthema. Dermatomycosis.	2

Practicals (90 lessons):
Practicals would be realized on terrain. They would include clinical examination, reviewing of clinical findings, giving diagnosis and implementation of therapy.

Organization	Theory classes: 3 lessons a week (VII semester) and 2 lessons a week (VIII semester), i.e. total 5 lessons a week in the two semesters. Practicals: 3 lessons a week (VII semester) and 2 lessons a week (VIII semester), i.e. total 5 lessons a week in the two semesters.
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

teaching

Scoring of the student's activities:

Activity type	*Points*	
	Minimum	*Maximum*
Attendance on theory classes	**10**	**15**
Attendance and activity (knowledge) on Practicals	**17**	**22**
Written assay	**0**	**8**
Periodical evaluations,	**10+10 (20)**	**20+20 (40)**
Final test	**5**	**5**
Final exam	**0**	**10**
Total	**52**	**100**
Complete final exam	***Grade mark/Points*** **Six (6) / 20** **Seven (7) / 25** **Eight (8) / 31** **Nine (9) / 38** **Ten (10) / 45**	

Prerequisite criteria:

- To get right to attend final exam, the student has to gain minimum 40 points from the attendance of theory classes and practicals, periodical evaluations and final test.
- If the student does not gain required minimum on the first periodical evaluation, he/she could not attend the second one.
- Students who did not passed the periodical evaluations reach directly on final exam (if they have right to it).
- The complete final exam has written and oral part, and depending on the grade mark gained, the student gets appropriate points.
- Final exam could be attended by the students who had gained minimum 60 points from the attendance of theory classes and practicals, periodical evaluations and final test, but who want to get higher grade mark from one predicted according points gained. Final exam takes 10 points and correspondents with student's results. If the student's results are not corresponding with the grade mark wanted by the student, he/she keeps the grade mark got with previously gained points.
- Final test is obligatory and it is done practically on the farm.

Evaluation of knowledge

Periodical evaluation (two): written
Final exam: written-oral
Complete final exam: oral + written

Final grade mark forming criteria:

Points	*Grade mark*
to 59	**5 (F)**
60-67	**6 (E)**
68-75	**7 (D)**
76-85	**8 (C)**
86-95	**9 (B)**
96-100	**10 (A)**

Basic teaching aids

1. Srbislav M. Stamatovic, Miodrag J. Jovanovic: Bolesti papkara I Bolesti goveda. Veterinarski fakultet Beograd, 1988.
2. Srbislav M. Stamatovic, Miodrag J. Jovanovic: Bolesti papkara II Bolesti ovaca i koza. Veterinarski fakultet Beograd, 1988.
3. Srbislav M. Stamatovic: Bolesti svinja. VKS, Beograd, 1993.
4. Forenbacher, S: Klinicka patologija probave i mijene vari domacih zivotinja. Svezak I/1-Klinicka patologija probave i resospcije. JAZU, Zagreb 1975.
5. Forenbacher, S: Klinicka patologija probave i mijene vari domacih zivotinja. Svezak I/2 Klinicka patologija probave i resorpcije JAZU, Zagreb 1983.
6. Merck Veterinary Manual.
7. Bradford P. Smith: Large Animal Internal Medicine. 2008

Course	**SPECIAL SURGERY WITH ORTHOPAEDICS**	**6 credit points**
Code	**FVM416**	
Year of study	**Fourth and Fifth (IV and V)**	
Semester	**Eighth and Ninth (VIII and XI)**	
Total teaching lessons	**150 (90+60)** **VIII semester 2+4 (30+60)** **IX semester 2+2 (30+30)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Plamen Trojachanec, PhD	
Realized by	prof. Plamen Trojachanec, PhD ass. Ksenija Ilievska, MSc	
Purpose and objectives of the course program	**A place that course occupies in veterinary education**: The course should provide implementation of previously acquired knowledge of diagnostic and treatment of surgical and orthopedic diseases in large and pet animals and horses. **Aim of the course:** To enable the student for independent examination, diagnosis and performing the most common surgical interventions in large and pet animals and horses. Thereby, the students will be trained to perform surgical examination of the patients based on anamnesis, clinical findings and laboratory tests to establish the diagnose, to perform conservative and operative treatment of surgical and orthopedic problems in large and pet animals and horses and to carry out adequate postoperative care and prognosis for the final outcome. Training should develop skills for human and responsible treatment of the patients during manipulation and taming, proper relation and communication with the owners and colleagues. **Relations of the course with previous and future education:** The course is closely related with all the preclinical courses, especially Anatomy of animals, Pathology and Microbiology and represents a requirement for dealing with clinical patients.	

No of lessons	***Teaching unit***	***Contents of teaching unit***
I. Eighth semester (40 lessons) Surgery of pet animals and equines		
2	Surgery of the respiratory system	− surgical approach to nasal passes − surgical approach to the larynx − diaphragmatic hernia − pneumotorax − surgical approach to the lower part of respiratory system
9	Surgery of the gastrointestinal system	− disease of the oral cavity and oropharynx − disease of the oesophagus (oesophagotomy, oesophageal diverticula and strictures) − gastrotomy − gastric dilatation volvulus − pyloric stenosis − enterotomy − resection and anastomosis − postoperative care
2	Colic in horses – surgical treatment	− surgical principles for laparotomy − postoperative care and complications
2	Surgery of the perineum, rectum and anus	− perianal fistulae − rectal prolaps, − perineal hernia
2	Surgical disease of endocrine and hematopoietic system	− general principles and techniques − surgery of the liver, spleen and pancreas
4	Fundamentals orthopedic surgery	− fracture classification and diagnosis − fracture healing − orthopedic examination − fracture fixation system and reduction techniques −
11	Surgical diseases of locomotory system (companion animals and horses)	− bones and joints disease − disease of muscles and tendons − disease of the hoof and distal phalanx
8	Surgery of urogenital system	− renal, urethral and cystic calculi − cystotomy − urethrotomy/urethrostomy − nephrotomy

		– ovariohysterectomy – cesarean section, pyometra, uterine torsion – uterine and vaginal prolapsed/neoplasia – perineal puerperal injuries – vestibuloplastics – mammary gland (neoplasia, abscess, mastectomy) – prostatic cyst, neoplasia and abscess – penile and prepucial trauma and neoplasia – phimosis and paraphimosis – castration, criptorhism (indication, surgical techniques, postoperative care and complications)

No of lessons	**Teaching unit**	**Contents of teaching unit**
II. Ninth semester (30 lessons) Farm animals surgery		
1	General principles in farm animal surgery	– surgical instruments – preoperative assessment – animal restraint – sedation and anesthesia
2-4	Surgery of the head and neck	– decornuation – frontal sinus trepanation – surgical procedures of the eye and orbit – tracheotomy – oesophagotomy
5-10	Abdominal surgery	– explorative laparotomy (left/right) – rumenotomy – surgical disease of abomasum – intestinal obstruction – hernias and management of umbilical masses – abdominocentesis and liver biopsy
11-15	Surgery of the urogenital system (female)	– cesarean section – vaginal prolapsed – uterine prolapsed – perineal lacerations
16-18	Surgery of the urogenital system (male)	– penis hematoma – prepucial prolapse – urolythiasis – vasectomy – congenital disease – castration
19-20	Surgery of the udder	– stenosis – obstructions – traumatic lacerations – amputation of papilla
21-11	Surgery of the locomotory system	– importance and economic influence – terminology – interdigital necrobacillosis – interdigital hyperplasia – sole ulcer – white line disease – laminitis – other pathological disease of the claw – digital amputation – corrective trimming – prevention – pathological conditions of proximal part

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
I. Eighth semester (60 lessons) Pet animals and equines	
1-10	Examination and surgical procedures of the head – surgical approach to the nasal folds, stenosis

	– surgical approach to the larynx – tracheotomy – intubation and anesthesia in companion animals – marking (tattooing) and application of implants – surgical approach to the salivary glands – surgical approach to the hard and soft palate – mandibulectomy and maxilectomy – tonsillectomy – surgical approach to the oropharynx – anesthesia of the eye and orbit, enucleation and exenteration
11-25	Examination and surgical procedures of the gastrointestinal system – celiotomy (indication, aims and surgical techniques for celiotomy) – oesophagotmy – gastrotomy – enterotomy – megacolon – rectal prolapse and perianal fistulae – surgical extirpation of perianal glands – hernia
26-41	Surgery of the locomotory system – diagnosis and therapy for lameness – horse showing – fracture examination and reduction – joint luxation and reparation – amputation
42-46	Surgery of the urinary system – surgical approach to the urethra and urethral calculi – cystotomy – nephrotomy
47-60	Surgical procedures of the reproductive system – ovariohysterectomy – cesarean section – castration – surgical procedures of the external reproductive organs – surgical procedures of perineal area

No of lessons	***Teaching unit and contents of teaching unit***
II. Ninth semester (30 lessons) Farm animals	
1-2	Approach and fixation techniques
3-7	Surgical procedures of the head – decornuation – frontal sinus trepanation – surgical procedures of the eye and orbit – tracheotomy – oesophagotomy
8-16	Surgical procedures of the gastrointestinal system – explorative laparotomy (left/right) – rumenotomy – surgical disease of abomasum – intestinal obstruction – hernias and management of umbilical masses – abdominocentesis and liver biopsy
17-20	Surgical procedures of the urogenital system
22-27	Surgical procedures of the locomotory system
28-30	Surgery of the udder

Organization	VIII. Semester Theory classes: 3 lessons a week (40 lessons) Practicals: 4 lessons a week (50 lessons) IX. Semester Theory classes: 2 lessons a week (30 lessons) Practicals: 2 lessons a week (30 lessons)

Teaching methods	**Course methodology:** Introduction with the performing of surgical techniques on different organic systems through interactive teaching based on theoretical exposure of the material, discussions and preparation of seminars that encourage independent work of students, individually or in groups. Practicals comprises of work in a smaller groups on surgical patient that will enable overcoming the techniques of surgical treatment with postoperative care, anesthesia and analgesia in surgical patients, providing intensive care and monitoring of critical patients.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	*Points*	
	minimum	*maximum*
Attendance on theory classes	**3**	**5**
Attendance and activity (knowledge) on practicals	**5**	**10**
Oral/written exam - pet animals and equines	**15**	**30**
Oral/written exam - farm animals	**15**	**30**
Practical exam	**15**	**25**
Total:	**53**	**100**

Final exam (optional)	***30***	***60***
Written assay (optional)	***0***	***5***

Evaluation of knowledge	**Oral/written exam - pet animals and equines** participates with **30%** in grade formation. (Rule: it will be held one week after the lectures are finished). Test with less than 50% correct answers will not be considered in further calculation. **Oral/written exam - farm animals** participates with **30%** of total points. (Rule – it will be held one week after the block lectures of Anesthesiology). Test with less than 50% correct answers will not be considered in further calculation. **The practical exam** participates with **25%** of total points and represents a requirement in final grade formation. **Attendance at theory classes and practicals** participates with **15%**. Students, who attend less than 30% of total **theory classes**, will not receive any points. Attendance between 30-60% brings 2.5 points, while the attendance in more than 60% of theoretical teaching carries 5 points. Students that attended on less than 40% of **Practicals** will not receive any points. Attendance between 40-70% at Practicals carries 5 points, while attendance in more than 70% brings 10 points. The students have an opportunity to prepare a written assay, which brings up to **5 points**. The grade is obtained for each of the exam parts, according to the criteria listed on the test. To calculate the total points from each test, the grade from the tests is multiplied with the percentage of participation of the exam part and is divided with 10. Final grade is formed as the sum of the points from the tests, points from the practical exam and points gained from the attendance of theory classes and practicals. Students who have not received a positive evaluation from both tests or they are not satisfied with their results, can take a final exam. In this case, previously gained points are not included in the calculation. The tests are performed at precisely given date and are required for all the students. The tests can be taken up to two times after which the course is re-enrolled. Terms for the exam will be announced at the beginning of the test sessions. **Final grade mark forming criteria:**

Points	*Grade mark*
до 52	**5 (F)**
53-57	**6 (E)**
58-67	**7 (D)**
68-85	**8 (C)**
86-95	**9 (B)**
96-100	**10 (A)**

Basic teaching aids	**Required:** Lecture materials, Тројачанец П., *Прирачник по општа хирургија*, 2005, Факултет за Ветеринарна медицина Скопје; Тројачанец П., *Основи на ветеринарна хирургија*, Факултет за Ветеринарна медицина Скопје; Тројачанец П., Илиевска К., 2009, Основи на ветеринарната анестезиологија **Recommanded**: Slatter Douglas, *Textbook of small animal surgery* 2nd edtition, 2002 Sounders; Fossum Theresa W., *Small animal surgery* 2nd ed., 2002 Mocby; Thurmon J.C., Tranquilli W.J.,

	Benson G.J.Lumb & Jones *Veterinary Anesthesia* 3rd edition. 1996, Williams &Wilkins; Perimatei D., Flo G., DeCamp C. *Small animal orthopedics and fracture repair* 2006 Saunders; Harari J. *Small animal surgery* 1996 Williams & Wilkins; Swaim S., Henderson R. Small animal wound management 1990 Williams & Wilkins; Vasić J., *Osnovi veterinarske hirurgije* 1996, Budić Z., Cvetković Z., Petković B. *Anestezija malih životinja* 1997 Prosveta; Veterinarski fakultet Beograd; Vjekoslav Srebočan, Hrvoje Gomerčić *Veterinarski priručnik*, četvrto dopunjeno izdanje, Zagreb

Course	**HYGIENE AND TECHNOLOGY OF MEAT, FISH, EGGS AND HONEY**	**7.5 credit points**
Code	**FVM 511**	
Year of study	**Fifth (V)**	
Semester	**Ninth and Tenth (IX and X)**	
Total teaching lessons	**105 (60+45)** **IX semester 2+1 (30+15)** **X semester 2+2 (30+30)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Pavle Sekulovski, PhD	
Realized by	prof. Pavle Sekulovski, PhD ass. prof. Dean Jankuloski, PhD	
Purpose and objectives of the course program	**THEORY CLASSES.** This course is intended to teach students the hygiene and control of meat production and processing. Overview of veterinary-sanitary cotrol of fish, eggs and honey is also included. Students are familiarized with welfare principles during the transport, reception at slaughterhouse, rest in the lairage and human slaughtering. Requirements for slaughterhouses and meat processing establishments are also teached. Pre-mortal and post-mortal examination of food producing animals are elaborated as well as processes of muscle to meat conversion. Principles of meat preservation and processing a meat to different meat products. Technology of fish, eggs and honey products. **PRACTICALS.** Practical course is divided in laboratory part and field visits to different food processing establishments. Laboratory exercises consists of methods for determination of meat, fish, eggs and honey quality. Field visits are predicted to introduce the students with slaughterhouses, animal slaughter, processing and grading of the carcasses. Students have the opportunity to perform pre-mortal and post-mortal examination of food producing animals and evaluate the safety of meat and organs.	

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1.	INTRODUCTION	
2.	ANIMALS AND BIRDS AS A MEAT SOURCE	Animals for slaughter, animal welfare
3.	ESTABLISHMENTS FOR SLAUGHTERING AND PRODUCTION OF MEAT	Slaughterhouses: importance, types. General hygienic and technological requirements. Facilities, equipment design, lairage, slaughter hall.
4.	FROM FARM TO SLAUGHTER	Loading, transport, unloading of animals. Fitness to travel. Stocking densities. Casualties. Animal husbandry in the lairage. Slaughter ban. Ante-mortem inspection
5.	SLAUGHTERING AND PROCESSING	Slaughter hygiene – Cattle Slaughter hygiene – Sheep and goats Slaughter hygiene – Pigs Slaughter hygiene – Poultry Slaughter hygiene – Rabbits Slaughter hygiene - Ostriches
6.	POST-MORTEM INSPECTION	Post-mortal inspection of different species of animals Assessment of fitness of meat and other parts. Certification and marking of Food of animal origin
7.	ANATOMY, MEAT CHEMISTRY AND QUALITY	Anatomy of animals for slaughter an descriptive terms. Chemical and biochemical composition of meat and organs. Meat quality.
8.	CONVERSION OF MUSCLES TO MEAT	Postmortal processes in meat. Rigor mortis. Meat conditioning. Types and categories of meat.
9.	MEAT INDUSTRY BY-PRODUCTS	Types of meat industry by-products.

10.	MEAT PRESERVATION AND PROCESSING	Thermal processing. Chilling and freezing. Chemical preservation. Curing. Irradiation. Canning.
11.	COMMINUTED PREFORMED NOT THERMALY PROCESSED MEAT PRODUCTS	Introduction, technology, chemistry, microbiology, defects, spoiling, Control during the production.
12.	CURRED MEAT PRODUCTS	Introduction, technology, chemistry, microbiology, defects, spoiling, Control during the production.
13.	THERMAL PROCESSED MEAT PRODUCTS	Introduction, technology, chemistry, microbiology, defects, spoiling, Control during the production.
14.	THERMAL PROCESSED AND CURED MEAT PRODUCTS	Introduction, technology, chemistry, microbiology, defects, spoiling, Control during the production.
15.	FERMENTED SAUSSAGES	Introduction, technology, chemistry, microbiology, defects, spoiling, Control during the production.
16.	CANNED MEAT PRODUCTS	Introduction, technology, chemistry, microbiology, defects, spoiling, Control during the production.
17.	DRYED AND SMOKED MEAT PRODUCTS	Introduction, technology, chemistry, microbiology, defects, spoiling, Control during the production.
18.	HYGIENE OF POULTRY MEAT	Poultry meat safety and quality. Mechanically deboned meat.
19.	HYGIENE OF GAME AND RABBIT MEAT	Game meat safety and quality. Control during the transport
20.	HYGIENE OF FISH AND FISH PRODUCTS	Types of fish. Hygiene and quality criteria. Fish processing. Control of fishing, fish processing establishments. Fish industry by-products.
21.	HYGIENE OF CRUSTACEANS, MOLLUSCS, FROGS AND SNAILS	Crustaceans, molluscs, frogs, snails. Post-mortem processes. Safety and quality. Control during the transport and processing.
22.	HYGIENE OF EGGS AND EGG PRODUCTS	Eggs and egg products: composition and properties, changes during storage, anomalies, decomposition, preservation. Safety and quality criteria. Control during production and transport.
23.	HYGIENE OF HONEY AND OTHER BEE PRODUCTS	Honey: types, forging, decomposition. Safety and quality criteria.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1.	Visit to cattle and pig slaughterhouse. Introduction to slaughterhouse properties and functioning from lairage to final product and treatment of sewage.
2.	Cattle - Ante-mortem inspection, slaughter and carcase processing.
3.	Pigs - Ante-mortem inspection, slaughter and carcase processing.
4.	Sheep - Ante-mortem inspection, slaughter and carcase processing.
5.	Poultry slaughterhouse, bird reception, slaughter, processing
6.	Post-mortem inspection of carcasses and organs
7.	Judgement of fitness for human consumption and specific risks to human and animal health
8.	Carcass classification and meat categorisation
9.	Meat quality assessment -chemical analyses -physical analyses
10.	Visit to meat processing establishment. Processing technologies. Control.
11.	Visit to snails processing establishment.
12.	Visit to honey establishment. Processing technologies. Control.
13.	Inspection of meat products.
14.	Inspection of fish and fish products.
15.	Inspection of eggs and egg products.

Organization	Theory classes: 2 lessons a week (30 lessons) in IX semester, i.e. 2 lessons a week (30 lessons) in X semester Practicals: 1 lesson a week (15 lessons) in IX semester, i.e. 2 lessons a week (30 lessons) in X semester
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work

<table>
<tr><td></td><td>(assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>24</td><td>30</td></tr>
<tr><td>Written assay</td><td>5</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>10</td><td>20</td></tr>
<tr><td>Final exam</td><td>9</td><td>25</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
Prerequisite criteria: For being able to pass the final exam student has to gain up to 45 points from theory classes and practicals and the two periodical evaluations. If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two): written
First periodical evaluation: - general part
Second periodical evaluation: - special part
Final exam: oral
Complete final exam: oral and written (includes one periodical evaluation)
Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Бунчиќ, С. (2006) Integrated Food Safety and Veterinary Public Health
2. Gracey,J., Collins, D.S., Huey, R. (1999) Meat Hygiene
3. Varnam, A. H., Sutherland J. P. (1995) Meat and Meat Products
4. Herenda, D.C., Franco, D.A. (1991) Food animal Pathology and Meat Hygiene
5. Bremner, A., Johnston, M. (1996) Poultry Meat Hygiene and Inspection
6. Wilson W. G. (1997) Wilson’s practical meat inspection
7. Fidel T. (2007) Handbook of fermented meat and poultry
8. Данев, М. (1999) Хигиена и технологија на месо, риби, јајца и нивни производи</td></tr>
</table>

Course	**HYGIENE AND TECHNOLOGY OF MILK**	**4.0 credit points**
Code	**FVM 512**	
Year of study	**Fifth (V)**	
Semester	**Ninth (IX)**	
Total teaching lessons	**60 (30+30)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Pavle Sekulovski, PhD	
Realized by	prof. Pavle Sekulovski, PhD	
Purpose and objectives of the course program	**THEORY CLASSES**. Students should acquire competence for independent performance of professional duties in the field of veterinary-sanitary control of production, processing and trading of milk and milk products. They should be capable to apply profesional and scientific approved methods and skills. **PRACTICALS.** Laboratory practice consists of physic-chemical methods for evaluation of quality of milk and milk products. Students are learning to be capable to perform analyses and evaluate hygiene and quality of milk and milk products. Field trips consists of visits to dairy factories and practical training in technological processes of producing of milk and control of milk products safety.	

THEORY CLASSES

No of lessons	*Teaching unit*	*Contents of teaching unit*
1.	MILK IN HUMAN DIET	Milk productions worldwide and domestically. Milk and milk products consumption worldwide and domestically.
2.	MORFOLOGY OF MAMMARY GLAND AND LACTATION	Morphology of mammary gland. Physiological basis of lactation. Lactation pathology.
3.	MILK – COMPOSITION AND PROPERTIES	Chemical composition of cow, sheep and goat milk. Colostrum. Sensory properties of milk. Physical properties.
4.	ASSESMENT OF MILK SAFETY	Safety and quality of milk during mastitis, zoonoses and other infectious diseases and abnormalities
5.	DAIRY MICROBIOLOGY	Microbiological contamination of raw milk, thermally processed milk and milk products. Influence of microorganisms to hygiene and technological properties of milk
6.	HYGIENE OF MILK PRODUCTION	Hygiene of milk production, milking machines. Handling of milk at farms and milking. Milk transport. Veterinary control of milk production
7.	DAIRY ESTABLISHMENTS	Hygiene and technology requirements for dairies and milk processing establishment. Sanitation in milk industry
8.	SECONDARY PROCESSING OF MILK	Treatment with milk in the processing establishments, transport and retail. Veterinary control in the processing establishments and retail. Spoiling of milk.
9.	PASTEURISED AND STERILISED MILK	Introduction, technology, chemistry, microbiology, defects, spoiling, Control during the production.
10.	FERMENTED MILK PRODUCTS	Introduction, technology, chemistry, microbiology, defects, spoiling, Control during the production.
11.	CHEESE	Introduction, classification, technology, chemistry, microbiology, defects, spoiling, Control during the production.
12.	BUTTER	Introduction, technology, chemistry, microbiology, defects, spoiling, Control during the production.
13.	CANNED MILK	Introduction, technology, chemistry, microbiology, defects, spoiling, Control during the production. Types: milk powder, condensed milk, sweetened milk
14.	ICE CREAM AND OTHER MILK PRODUCTS	Intro, technology, chemistry, microbiology, defects, spoiling, Control during the production.

PRACTICALS

No of lessons	*Teaching unit and contents of teaching unit*
1.	Sampling of milk, Sensory evaluation of milk
2.	Physical testing of milk
3.	Confirmation of milk adulteration and determination of milk freshness
4.	Determination of fat content
5.	Determination of protein and dry matter content
6.	Determination of milk pasteurisation
7.	Determination of residues presence in milk and milk products
8.	Microbiological testing of milk and milk products
9.	Counting of somatic cells and diagnostic of mastitis
10.	Determination of microorganisms causing brucellosis and tuberculosis
11.	Determination of cleanliness of milking machines
12.	Sampling, sensory evaluation and chemical analyses of milk products
13.	Construction of dairy establishments (facilities and equipment) – **field visit**
14.	Processing of milk into dairy products – **field visit**
15.	Traditional dairy products production in bachilo – **field visit**

Organization	Theory classes: 2 lessons a week (30 lessons) Practicals: 2 lessons a week (30 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

related with teaching	**Scoring of the student's activities:** **Prerequisite criteria:** For being able to pass the final exam student has to gain up to 45 points from theory classes and practicals and the two periodical evaluations. If student does not show result on the one of the periodical evaluations, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation: - general part Second periodical evaluation: - special part **Final exam:** oral **Complete final exam:** oral and written (includes one periodical evaluation) **Final grade mark forming criteria:**
Basic teaching aids	Стојановиќ, Л., Катиќ, В. (1998) Хигиејена млека Мијачевиќ, З. (1992) Технологија млека-ферментисана млека и сиреви Миљковиќ, В., Катиќ, В. (1989) Приручник лабораториских анализа млека и производа од млека

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on practicals	**24**	**30**
Written assay	**5**	**10**
Periodical evaluations (two)	**10**	**20**
Final exam	**9**	**25**
Total:	**60**	**100**

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)**

Course	**BIOLOGY AND PATHOLOGY OF FISH**	**4.0 credit points**
Code	**FVM 513**	
Year of study	**Fifth (V)**	
Semester	**Ninth (IX)**	
Total teaching lessons	**60 (30+30)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	***Theory classes*** of biology and pathology of fish course as a main goal has to introduce students with the meaning of fishery and aquaculture in Republic of Macedonia, basics of ecology in aquatic ecosystems, basics of aquaculture and commercial production of the most important fish species, general diseases characteristics, viral, bacterial, fungal, parasitic, exotic and fish diseases with non-infectious etiology, roe diseases, larva and aquarium fish, fish biological enemies and pests, disease prevention and human protection of zoonoses, control measures and disease eradication and legal regulative for eradication of the most important fish diseases. In this manner, the future doctor for veterinary medicine will be able to gain knowledge for recognition of the main clinical and pathomorphological changes of fish diseases, be capable for advising and applying proper medication for fish diseases, be capable for consulting for taking prevention measures including promotion of optimal health and aquacultural production. ***Practicals*** of biology and pathology of fish course has an aim to introduce students with: fish systematic, fish species in Republic of Macedonia, fish anatomy and physiology, practical aspects of intensive aquaculture, diagnosis of fish diseases and implementing preventive means, control, therapy and eradication of fish diseases.	

Contents

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1 - 2	FISHERY AND AQUACULTURE	Historical development of fishery, development of aquaculture, fish production, aquaculture in Republic of Macedonia, definition and importance of ichthyopathology.
3 - 4	BASICS OF THE ECOLOGY IN THE AQUATIC ECOSYSTEMS	Water as a living environment, types of aquatic ecosystems, ecological factors in aquatic environment, arrangement and composition of aquatic living environment, pollution of the aquatic environment and water quality.
5 - 8	AQUACULTURE	General terms of aquaculture, fish species which are bred, types of aquaculture, elements in selection of location and building fish pond, types of fish ponds, warm-water fish ponds, cold-water fish ponds, calendar of technological processes.
9 - 10	GENERAL CHARACTERISTICS OF FISH DISEASES	Etiology and epidemiology of infectious and parasitic diseases in fish.
11 - 12	VIRAL FISH DISEASES	Contagious pancreatic necrosis, viral hemorrhagic septicemia, contagious hematopoietic necrosis and sleeping disease in trout, spring viremia, pox and gill necrosis in carp and lymphocystosis
13 - 14	BACTERIAL FISH DISEASES 1	Erythrodermatitis, furunculosis, other septicemias from G-bacteria, vibriosis, yersiniosis, edwardsiliosis, catfish septicemia, trout ulcer disease, bacterial nephritis.
15 - 16	BACTERIAL FISH DISEASE 2 AND MYCOTIC FISH DISEASES	Columnaris, Cytophage disease, bacterial gill disease, mycobacteriosis, nocardiosis, bacteria in fish that are pathogen for warm-blooded animals and human; Barnchiomycosis, ichthysporidiosis, saprolegniosis and crustacean plague
17 - 20	PARASITIC FISH DISEASES	Trypanosomiasis and trypanoplasmosis, Ichthyobodosis, cryptobiosis, hexamitiasis, coccidiosis, mixosomiasis, inflammation of the swim bladder in carp, proliferative kidney disease, chilodonellosis, ichthyophthiriosis, dactylogyrosis, gyrodactylosis, posthodiplostomatosis, diplostomatosis, sanguinicolisis, caryophyllidosis, bothriocephalosis, triaenophorosis, ligulosis, anguillicolosis, acanthocephaloses, fish helmintozoonosis, hirudinosis and diseases caused by crustaceans
21 - 22	DISEASES WITH NON-INFECTIOUS ETIOLOGY	Stress, diseases with nutritional etiology, neoplasms, environmental diseases and poisoning
23 - 24	EXOTIC FISH DISEASE AND ROE AND LARVA DISEASES	Epizootic hematopoietic necrosis, viral disease of Californian trout, channel catfish viral disease, infectious salmon anemia, epizootic ulcerative syndrome, roe saprolegniosis, hydrocele embrionalis in trout, larva diseases caused by Chlamydotrix ochraceae
25 - 26	BIOLOGICAL ENEMIES AND PESTS OF FISH AND DISEASES OF AQUARIUM FISH	Enemies from the class of mammalians, birds, reptiles, amphibian, fish, arthropods and mollusca. Viral, bacterial mycotic, parasitic and diseases caused by poor chemical composition of water.
27 - 30	FISH HEALTH PREVENTION AND RELATED LEGISLATIVE	Fish diseases prevention, ichthyotechnical, ichthyohygienic, and ichthyosanitary measures, quarantine, disinfection, disease control and eradication measures, International regulative, legal regulatives in R. Macedonia, legal terminology and ichthyo-sanitary records.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1-2	Fish systematic and fish species bred in Republic of Macedonia
3-4	Fish anatomy
5-6	Fish physiology
7-8	Practical aspects of intensive aquaculture
9-10	Basis of fish diseases diagnosis
11-12	Diagnosis of viral fish diseases
13-14	Diagnosis of bacterial fish diseases
15-16	Diagnosis of mycotic fish diseases
17-20	Diagnosis of parasitic fish diseases

21-22	Drugs application in fish
23-24	Fish vaccination
25-26	Visiting earth carp fish pond
27-28	Visiting cage carp/trout fish pond
29-30	Visiting trout fish pond

Organization	Theory classes: 2 lessons a week (30 lessons) Practicals: 2 lessons a week (30 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** ***Activity type*** / ***Points*** (***minimum*** – ***maximum***): **Attendance on theory classes** 12 – 15 **Attendance on practicals** 12 – 15 **Written assay** 6 – 10 **First periodical evaluation** 15 – 30 **Second periodical evaluation** 15 – 30 **Total:** 60 – 100 * With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student get right to take grade mark without passing the complete final exam. * Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.
Evaluation of knowledge	**Periodical evaluation (two):** written **First periodical evaluation**: fishery and aquaculture, basics of ecology in aquatic ecosystems, aquaculture, general diseases characteristics, viral and bacterial fish diseases, fish systematic and fish species bred in R. Macedonia, fish anatomy and physiology, practical aspects of intensive aquaculture, basics of diagnosing fish diseases, diagnostic of viral and bacterial fish diseases. **Second periodical evaluation**: mycotic and parasitic fish diseases, diseases with non-infectious etiology, exotic fish diseases, roe and larva diseases, biological enemies and pests of fish, aquarium fish diseases, fish health protection, and legal regulative, diagnosis of mycotic and parasitic fish diseases, drugs application in fish, fish vaccination. **Complete final exam:** Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are: ***Grade mark*** / ***Points***: **5** – **to 59** **6** – **60-68** **7** – **69-76** **8** – **77-84** **9** – **85-92** **10** – **93-100** **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. Христовски М., Стојановски С.: **Биологија, одгледување и болести на рибите**. Национален форум за заштита на животните на Македонија, Скопје, 2005. 2. Христовски М., Кожухаров С.: **Маркетинг менаџмент во аквакултурата**. Национален форум за заштита на животните на Македонија, Скопје, 2004.

Course	**FORENSIC VETERINARY MEDICINE AND VETERINARY ETHICS**	**3.5 credit points**
Code	**FVM 514**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**45 (30+15)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	ass. prof. Trpe Ristoski, PhD	
Realized by	ass. prof. Trpe Ristoski, PhD	
Purpose and objectives of the course program	**The theory classes of the course Forensic veterinary medicine and veterinary ethics** make a synthesis of all the previously absolved subjects in the veterinary studies. Special attention will be payed on the diseases from legal aspect, first of all the latency and the lasting of the disease.The ethics in this course is studied from the aspect of the moral and ethical behaviour of the veterinary doctor during the performance of their professional activity. **The practicals** acquaint the student with the practical use of the law during everyday veterinary practice and at the same time acquaints the student with the codex of the veterinary-medicine ethics.	

Contents

THEORY CLASSES

Реден број на часови	***Teaching unit***	***Contents of teaching unit***
1-2	INTRODUCTION AND HISTORY OF THE FORENSIC VETERINARY MEDICINE	What is the forensic veterinary medicine studying and its' history. Law for obligatory maters and other laws.
3-4	CORTS (FUNCTION AND JURISDICTION)	Function and role of the courts
5-6	EXPERTISE, GENERAL AND SPECIAL METHODS	Expertise, findings, opinion, expert, conditions, warranty, deals, lawsuits. Forms and methods of expertise, opinion, latency, lasting of the process est.
7-8	PROFESSIONAL MISTAKES	Responsibilities for the professional mistakes. Legal responsibility. Responsibility of the work organization or individual. Professional mistakes during clinical examination of the animals, during the therapy, with the choice of the drug.
9-10	GENERAL PATHOMORPHOLOGICAL CHANGES	Atrophy, dystrophy, necrosis, irregular circulation, irregular metabolism, tumours etc.
11-12	COMMON DISEASES CAUSED BU BACTERIA AND VIRUSES	Anthrax, brucellosis, anaerobes, tetanus, TBC, rubies etc.
13-14	COMMON DISEASES CAUSED BU PARASIETS	Ascaridosis, Ehinococcosis, Fasciliosis, Coccidiosis, Piroplasmosis, Scabies etc.
15-16	***TEST No I***	
17-18	DISEASES DIFECTS IN HORSES	Asthma, Colic, Caracus, Zura, Eye disorders etc.
19-20	DISEASES AND DIFECTS AT CATTLE, SHEEPS AND GOATS	TBC, Paratuberculosis, Actynomycosis, Ketosis, Traumatic reticulo-pericarditis, Mammary gland, Retentions, Paresis, Indigestions, est. Ectima, Infectious lameness, Coenurusis, Infectious agalactia, Scrapie, Lung adenomatosis etc.
21-22	DISEASES AND DIFECTS AT PIGS AND DOGS	Salmonellosis, Erysipelas, Dysentery, Atrophic rhinitis, TGE, Cysticercosis, Trichinelosis, criptorhism etc. Distemper, Parvovirosis, Infectious hepatitis, Demodicosis, Irregularities of organs for sight, hearing and smell.
23-24	DISEASES AND DIFECTS IN POULTRY, BEES AND OTHER ANIMALS	Newcastle disease in poultry, Paratifus, Marek disease. Plague of the bees. Nosemosis etc.
25-26	GENERAL TERMS IN THE ETHICS, DEONTOLOGY, ORIGIN AND	What is ethics, what is morale and what it contains and studies. What contains and studies the science for the

	HISTORICAL DEVELOPMENT OF THE MEDICAL ETHICS. ETHICAL AND DEONTOLOGICAL PRINCIPS IN THE VETERINARY PROFESSION AND VETERINARY MEDICINE	obligations and which are its' basic postulates. Deontological behaviour and moral profile of the veterinarian. Awareness, morale filings, morale act est.
27-28	PROTECTION OF THE ANIMAL RIGHTS AND ANIMAL WELFARE. CODECS OF THE VETERINARY MEDICINE ETHICS	Protection of the animals and the animal environment. Veterinary-medicine ethics
29-30	***TEST No. II***	

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1.	Law for obligatory relationships
2.	Law for judicial and financial procedure
3.	Punishable deeds (criminal deeds, economically violations)
4.	Autopsy of domestic animals (theory)
5.	Autopsy of domestic animals (practical)
6.	Professional mistakes
7.	Professional mistakes
8.	Professional mistakes
9.	Forensic evaluation of the disease with common bacterial and viral etiology
10.	Forensic evaluation of the disease with common bacterial and viral etiology
11.	Forensic evaluation of the diseases in cattle, sheep and goats
12.	Forensic evaluation of the diseases in horses and pigs
13.	Forensic evaluation of the diseases in poultry
14.	Forensic evaluation of the diseases in bees and other animals
15.	Autopsy of the animals with forensic evaluation of the material shortage of corpses and organs from dead and slaughtered animals

Organization	Theory classes: 2 lessons a week (30 lessons) Practicals: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on practicals	**24**	**30**
Written assay	**5**	**10**
Periodical evaluations (two)	**10**	**20**
Final exam	**9**	**25**
Total:	**60**	**100**

	Prerequisite criteria: For being able to pass the final exam student has to gain up to 45 points from theory classes and practicals and the two periodical evaluations. If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.
Evaluation of knowledge	**Periodical evaluation (two):** written **First periodical evaluation**: Introduction and history of the forensic veterinary medicine; Cortes (function and jurisdiction); expertise, general and special methods; Professional mistake; General pathomorphological changes; Common disease caused by bacteria and viruses and common disease caused by parasites.. **Second periodical evaluation**: Diseases and irregularities in horses; Diseases and irregularities in cattle; Diseases and irregularities in goats and sheep; Diseases and irregularities in pigs; Diseases and irregularities in dogs; Diseases and irregularities in poultry, bees and rest of the animals, Veterinary medicine ethics. **Final exam:** oral

	Complete final exam: oral + practical **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. Проф. др. Бранислава Ѓукиќ: Судска ветеринарна медицина, Ветеринарски факултет - Београд, 1991; 2. Проф др. Зоран Алексиќ и Проф. др. Бранислава Ѓукиќ: Судска ветеринарна медицина (општи део), Ветеринарски факултет - Београд, 1999; 3. Мр. Саша Петричевиќ и Проф др. Бранислава Ѓукиќ: Форензичка процена болести и мане живине, 2002г.; 4. Проф др. Бранислава Ѓукиќ: Ветеринарно-медицинска етика, Ветеринарски факултет - Београд, 1996; 5. Закон за облигациони односи на РМ; 6. Мицевски Ц.: Обдукција на домашните животни. Вет. фак. Скопје-1998; 7. Ц. Мицевски и Т. Ристоски: Штенечак - Чума кај кучињата, Факултет за ветеринарна медицина - Скопје, 2000; 8. Мицевски Ц.: Болести кај пчелите. Медивет, Скопје, 1996.; 9. Софреновиќ Ѓ., Кнежевиќ Н.: Патоморфологија важних инфективних оболења домаќих животиња. Београд-Нови Сад- 1994.

Course	**BASIS OF MANAGEMENT WITH MANAGEMENT OF VETERINARY PRACTICE**	**3.5 credit points**
Code	**FVM 515**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**45 (30+15)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Blagica Sekovska, PhD	
Realized by	prof. Blagica Sekovska, PhD	
Purpose and objectives of the course program	***Theory classes*** This course has aim to introduce the student with basic knowledge from the field of management. This includes ability for communication with clients, colleagues and authorities from the public life. To solve these skills it is necessary to get some communicological abilities for active listening, as well as usage of some proper communicological forms. It is necessary to have sense for interaction of the doctor of veterinary medicine with his/her environment and social milieu. Also, very high priority is the ability for working in team, especially in multidisciplinary team. Also, this course would obtain possibility for the student to become aware about his/her responsibility, ability for basic calculation of costs, ability for business planning and organization, recognizing the meaning of motivation of employees, ranging and compensation of the work, as well as importance of the health and safety of the employees, etc. ***Practicals*** Practicals are support of the theory classes for additional elaboration of some topics from practical aspect via various teaching methods as dramatization of some hypothetic situations and problem solving, elaboration of different techniques for strategic planning in veterinary practice as the SWOT analysis, PEST analysis and other kinds of strategic paining, making of business plan for veterinary practice, exercises with communication with clients etc.	

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1-3	Introduction	What is management. Why do the veterinarians have need for this kind of training. Basic principles of management. Historic development of

		management.
4-6	Planning and strategic planning	What is planning and strategy. Definition of mission and vision. Strategic management and implementation of strategy in veterinary medicine.
7-9	Organization of work as management and process	Labor division, organizational structure and coordination of the work, managing, directing, communication and projecting of activities in the veterinary practice.
10-12	Communication in veterinary medicine	Basis, structure and types of communication, verbal and non-verbal communication, motivation and conflicts, how to deal with problematic client in your veterinary practice.
13-15	Building and working in team	Types of leaders, types of team players, development of the team and rules for successful team work in veterinary practice.
16-18	Human resources	The selection of the true employee, motivation, creativity and innovativity, disciplinary training, training and improvement rules in veterinary practice.
19 -21	Managing of veterinary practice	Modes of managing, motivation. Making decisions and control.
22--24	Client/customer service in veterinary practice	Client vs. customer, meaning of the prices, perspectives in the practice from the marketing aspect (location, budget, equipping).
26-28	Rules for efficient working of veterinary practice	Efficiency, efficiency. Realization of successful business, working balance in veterinary practice.
29-30	Veterinary practice as a economic paradigm	Determination of success balance. Determination of money flow. Indicators of the financial analysis.

PRACTICALS

No of lessons	***Teaching unit***	***Contents of teaching unit***
1-2	Making SWOT analysis	Exercise for environment analysis in veterinary medicine.
3 -4	Strategic planning	Application of strategic techniques and methods in planning of veterinary practice.
5-6	Organization of veterinary practice	Organizational structure and technical equipment of the practice.
7-8	Communication with the client	Dramatization of fictional situation with positive and negative possibilities.
9	Team-building	Babylon Tower, exercise for team building in veterinary medicine.
10	Human resources	Rules for successful selection of staff.
11-12	Basic aspects of marketing in veterinary practice	Making the price-list, promotion plan.
13-14	Making of business plan	Making of real business plan for proposed veterinary practice.
15	Managing	Modes of managing and communication in veterinary practice.

<table>
<tr><td>Organization</td><td>Theory classes: 2 lessons a week (30 lessons)
Practicals: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures with discussion and active participation of the students).
Practicals: practicals with dramatization of situation, case study, presentation of some teaching units by the students, discussion about topics of interest and other ways of work in smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.
Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>8</td><td>12</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>12</td><td>14</td></tr>
<tr><td>Written assay</td><td>10</td><td>14</td></tr>
<tr><td>Periodical evaluations (две)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">On student’s request for higher grade mark</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Besides attendance on theory classes and practicals additional condition for course teacher’s</td></tr>
</table>

	signature at the end of the semester, is passing of periodical evaluations during the semester with up to 25% points gained per evaluation. * Final exam is predicted on written request of the student if he/she want to gain grade mark higher than one which was gained with his/her previous activities. Student who did not pass one of the periodical evaluations during the semester goes to one of the periodical evaluation during the exam sessions.
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation: - general part Second periodical evaluation: - special part **Final exam:** not predicted **Complete final exam:** not predicted **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. Доц. д-р Благица Сековска: Авторизирани предавања за менаџмент во ветеринарството, Realized вуни во периодот од 2006 до денес на FVM-C 2. проф. Д-р Милан Тесиќ: Менаџмент ветеринарске праксе, Београд, 2007 3. Tomas E. Catanzaro, Philip Seibert: Veterinary practice management secrets, Philadelphia, 2000 4. Франјо Јозиц: Сустав успелог подузетништва, Загреб, 2004 5. Благица Сековска: Маркетинг менаџмент на анимални производи, Скопје 2008

Course	**VETERINARY EPIDEMIOLOGY**	**2.0 credit points**
Code	**FVM 516**	
Year of study	Fifth (V)	
Semester	Ninth (IX)	
Total teaching lessons	30 (15+15)	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Ivancho Naletoski, PhD	
Realized by	prof. Slavcho Mrenoshki, PhD ass. Kiril Krstevski, MSc	
Purpose and objectives of the course program	The aim of this course is to introduce the students with meaning and importance of the quantitative analysis of some disease in the population, as a addition to the knowledge about its etiology, diagnostics and control, both for particular animals and herds. Students would became related with elemental knowledge about main principles and analytical techniques used in the epidemiological studies.	

No of lessons	***Teaching unit***
1	Introduction
2	Development of veterinary medicine
3	Objective of the veterinary epidemiology
4	Concepts and principles in veterinary epidemiology
5	Description of the disease outbreak
6	Field researching
7	Observation studies
8-9	Diagnostic testings
10	Clinical investigations
11	Comparative epidemiology
12	Economy of diseases
13	Health schedules
14-15	Control and eradication of diseases

<table>
<tr><td>Organization</td><td>Theory classes - 1 lesson a week
Practicals - 1 lesson a week</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Performance of the computer simulation, i.e. solving tasks from the practical veterinary epidemiology. The tasks are in a written form, and solutions are found with computer, with use of WIN EPISCOPE 2.0 software.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.
Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>23</td><td>30</td></tr>
<tr><td>Written assay</td><td>0</td><td>5</td></tr>
<tr><td>Periodical evaluations (two)</td><td>10</td><td>20</td></tr>
<tr><td>Final exam</td><td>15</td><td>30</td></tr>
<tr><td>Complete final exam*</td><td colspan="2"><table><tr><th>Grade mark</th><th>Points</th></tr><tr><td>Six (6)</td><td>20</td></tr><tr><td>Seven (7)</td><td>25</td></tr><tr><td>Eight (8)</td><td>30</td></tr><tr><td>Nine (9)</td><td>35</td></tr><tr><td>Ten (10)</td><td>43</td></tr></table></td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
Prerequisite criteria: For being able to pass the final exam student has to gain up to 40 points from theory classes and practicals and the two periodical evaluations. If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two): written
Final exam: written-oral
Complete final exam: oral

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<tr><td>to 59</td><td>5 (F)</td></tr>
<tr><td>60-69</td><td>6 (E)</td></tr>
<tr><td>70-77</td><td>7 (D)</td></tr>
<tr><td>78-86</td><td>8 (C)</td></tr>
<tr><td>87-93</td><td>9 (B)</td></tr>
<tr><td>94-100</td><td>10 (A)</td></tr>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Dirk U. Pfeifer: Uvod u veterinarsku epidemiologiju, Sarajevo, 2000
2. Marc Stevenson: An Introduction to Veterinary Medicine, EpiCentre, IVABS, Massey University, New Zeland, 2005
3. Michael Thrusfield: Veterinary Epidemiology, Blackwell Science, 2007</td></tr>
</table>

Course	**VETERINARY TOXICOLOGY**	**2 credit points**
Code	**FVM 517**	
Year of study	**Fifth (V)**	
Semester	**Ninth (IX)**	
Total teaching lessons	**30 (15+15)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Romel Velev, PhD	
Realized by	prof. Romel Velev, PhD	
Purpose and objectives of the course program	**Theory classes** of the course Veterinary toxicology aim to introduce students with the main principles of veterinary toxicology: the structure, the way action and pharmacokinetics of toxic substances, pathogenesis, clinical diagnosis and treatment of poisoned animals, ethical, environmental implications and implications on human health from use of potential toxic substances; evaluation of products of animal origin contaminated with poisons and others. For student can demonstrate knowledge and understanding of veterinary Toxicology as a basis for the study and practice of clinical veterinary Medicine. In this way the future doctor of veterinary medicine will be possible to acquire: knowledge to identify the indications for medical intervention in poisoning; ability to provide advice and application of appropriate treatment of poisoning in individual life or group of animals, ability to give advice on preventive veterinary medicine, including promoting optimal health and production. **Practicals** of the course Veterinary toxicology aim to introduce students with: different groups of poisons and their characteristics; possible sources poisoning; procedure poisoned animals and antidote, taking and sending material chemic-toxicological analysis; how safe storage and safe removal of poisons, and to illustrate some abstract theoretical concepts through simple laboratory experiments.	

Contents

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
I. GENERAL TOXICOLOGY (6 lessons)		
1.	INTRODUCTION	Definition, range and subject of studying of toxicology; relation of toxicology with other sciences; brief history of toxicology
2.	DEFINITION OF POISON AND TERMINOLOGY	toxin, toxicosis, intoxication, toxic-infection, toxicy and toxicity, hazard
3.	CLASSIFICATION OF POISONS	classification of intoxications, classification of poisons and intoxication sources
4.	TOXOKYNETICS OF POISONS	Absorption, distribution, biotransformation, elimination
5.	TOXODYNAMIC OF POISONS	Mode of activity of poisons (interaction with the enzymes, oxygen transport block, interactions with cell functions); factors which have impact on toxicity (dose, physical condition, chemical features and structure, animal species and breed, body weight, gender, age)
6.	FUNDAMENTALS OF POISONING AND THREATMENT IN DOMESTIC ANIMALS	clinical symptoms, diagnosis (anamnesis, clinical symptoms, necropsy findings, toxicological-chemical analysis, test on laboratory animals); treatment: antidote (main principles, non-speciphic and speciphic antidote therapy) and symptomatic treatment
II. SPECIAL TOXICOLOGY (9 lessons)		
7.	PESTICIDES I - Insecticides	chlorated carbohydrogens, organ phosphate compounds, carbamates, pyrethrins and synthetic pyrethroids, dinitrophenols
8.	PESTICIDES II - Rhodenticides	anticoagulants, zinc phosphide, fluor organic compounds, alpha-naphtilthyourea (ANTU), sea squill
9.	PESTICUDES III - Fungicides	pentachlorphenol, ditiocarbamates, captan, folpet, captaphol, hexachlorbenzen
10.	PESTICIDES IV - Herbicides and lymacides	triazins, phenilurea derivates, chlorated phenoxi-acids, dipiridils, metaldehid
11.	METALS	arsenic, copper, zink, selen, iron, cadmium, lead, mercury
12.	INDUSTRIAL POLLUTANTS	polychlorated biphenils (PCB), fluorides, cyanides and cyanogenic plants
13.	NITROGEN COMPOUNDS	Nitrates, nitrites and nitroso-compounds; urea, ammonium salts and ammonia

14.	BIOTOXINS (mycotoxins)	Mycotoxicoses; Hepatotoxins (aphlatoxin, rubratoxin, sterigomastocytin); Nephrotoxins (ochratoxin, cytrinin); Estrogens (zearalenon); Cytotoxins (trichotecens); Fungal toxins (ergolalcaloids)
15.	POISONING PLANTS	Bracken fern (Pteridium aquilinum); Horsetail (Equisetum arvense); Autumn crocus (Colchicum autumnale); Leopard's bane (Doronicum caucasicum)

PRACTICALS

No of lessons	**Teaching unit and contents of teaching unit**
1- 2	Procedure with poisoned animal
3-4	Sampling and sending material for chemical-toxicological examination
5-6	Evaluation of safety of animal products from the poisoned animal
7-8	Antidotes in veterinary toxicology
9-10	Estimations in toxicology
11-12	Analytical and instrumental methods in veterinary toxicology
13-15	Visit of laboratory for control and examination of drugs and introducing with equipment used in veterinary pharmacology and toxicology.

Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** **Prerequisite criteria:** For being able to pass the final exam student has to gain up to 45 points from theory classes and practicals and the two periodical evaluations. If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation: General toxicology Second periodical evaluation: Special toxicology **Final exam:** oral **Complete final exam:** oral + written (includes one periodical evaluation) **Final grade mark forming criteria:**
Basic teaching aids	1. Srebočan, V.: ***Otrovanja.*** Vo: Srebočan, V. i Gomerčić, H.: Veterinarski priručnik. 4 izdanje, JUMENA, Zagreb 1989. 2. Srebočan, V.: ***Veterinarska toksikologija.*** Medicinska naklada, Zagreb 1993. 3. Dilov, P., Georgiev, B., Borissova, L., Stoyanov, K., Vrbcheva, V., Lazarova, S., Kostadinov, J., Kirov, K., Alexandrov, M., Angelov: ***Veterinary medical toxicology.*** Sofia., 2005. 4. Čupić, V.: ***Najčešća trovanja u veterinarskoj medicini.*** Univerzitet u Beogradu, Fakultet veterinarske medicine, Beograd 1999.

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on practicals	**24**	**30**
Written assay	**5**	**10**
Periodical evaluations (two)	**10**	**20**
Final exam	**9**	**25**
Total:	**60**	**100**

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)**

Course	**OPHTHALMOLOGY**	**2.0 credit points**
Code	**FVM 518**	
Year of study	**Fifth (V)**	
Semester	**Ninth (IX)**	
Total teaching lessons	**30 (15 + 15)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Plamen Trojachanec, PhD	
Realized by	prof. Plamen Trojachanec, PhD ass. Ksenija Ilievska, MSc	
Purpose and objectives of the course program	**Place the course occupies in veterinary education:** The course should encourage the students to apply their previously acquired knowledge of clinical anatomy, pathology, pathophysiology and pharmacology for diagnostics and treatment of ophthalmic diseases and fundamental treatment of ophthalmic patient. **Aim of the course:** To enable the student for individual work in daily practice. In addition, student can perform individual examination, diagnosis and conservative or operative treatment of ophthalmic diseases. **Relations of course with previous and future education:** The course is closely related with preclinical courses, especially Anatomy of animals, Pathology, Physiology of animals and General surgery with anesthesiology.	

Contents

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1	Anatomy of the eye	Anatomy and histology of the eye
2	Basic principles of ophthalmic disease	Diagnostic and treatment of ophthalmic diseases
3-4	Diseases of palpebrae, conjunctiva and lachrymal system	Basic principle and reparation techniques of eye diseases
5	Diseases of the eye globe and orbit	Disease and displacement of the eye globe
6-7	Diseases of the cornea	Diseases of the cornea with or without inflammatory symptoms
8	Diseases of the uveal tract	
9	Diseases of the lens and vitreous	Congenital and acquired disease of lens and vitreous and surgical repair
10	Diseases of the retina and optic nerve	Congenital and acquired disease of retina and surgical repair
11	Disorders influenced by intraocular pressure	Glaucoma, clinical signs, examination and treatment
12-13	Specific ophthalmological diseases	
14-15	Clinical examination and handling the ophthalmic patient	General and special methods for clinical examination

Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 1 lesson a week (15 lessons)
Teaching methods	**Course methodology:** Introduction with fundamentals of veterinary ophthalmology through interactive teaching based theoretical exposure of the material, discussions and preparation of written assay to encourage the students for independent work, individually or in small groups. Practicals comprises of work in smaller groups that will enable overcoming the practical knowledge of essential ophthalmology methods and techniques.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

	Scoring of the student's activities: <table><tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr><tr><th>minimum</th><th>maximum</th></tr><tr><td>Attendance on theory classes</td><td>5</td><td>10</td></tr><tr><td>Attendance and activity on practicals</td><td>3</td><td>5</td></tr><tr><td>Written assay</td><td>0</td><td>5</td></tr><tr><td>Test</td><td>52</td><td>80</td></tr><tr><td>Total:</td><td>60</td><td>100</td></tr></table>
Evaluation of knowledge	**The test on ophthalmology** participates with **85%** in grade formation. (Rule: it will be held one week after the lectures). Test with less than 50% correct answers will not be considered in further calculation. **Attendance at theory classes** participates with **15%**. Students, who attend less than 30% of **total theory classes**, will not receive any points. Attendance between 30-60% brings 5 points, while the presence in more than 60% carries 10 points. Attendance at Practicals participates with 5 points. The students have an opportunity to prepare a written assay, which brings up to **5 points**. The tests are performed at precisely given date and are required for all the students. The tests can be taken up to three times, after which the course is re-enrolled. Terms for the exam will be announced at the beginning of the test sessions. Summary of the test score, theory classes and practicals attendance establishes the final grade. **Final grade mark forming criteria:** <table><tr><th>*Points*</th><th>*Grade mark*</th></tr><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></table>
Basic teaching aids	***Required:*** Maticic Z., Capak D. *Oftalmologija domacih zivotinja*, 1999 Veterinarski fakultet Zagreb, *Veterinarski prirucnik*, Vetrinarski fakultet Zagreb **Recommanded:** Коичев К., Хубенов Х., *Veterinarno medicinska oftalmologija*, 1998, НИС Тракиски универзитет; Kirk N. Gelatt *Essentials of Veterinary Ophtalmology*, 2005, Blackwell; Simon M. Peteresen-Jones and Sheila M. Crispin *Manual of Small animal ophthalmology*, 2000 BSAVA

Course	**HERD HEALTH MANAGEMENT**	**2.5 credit points**
Code	**FVM 519**	
Year of study	**Fifth (V)**	
Semester	**Ninth (IX)**	
Total teaching lessons	**45 (15+30)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Toni Dovenski, PhD	
Realized by	prof. Toni Dovenski, PhD prof. Plamen Trojachanec, PhD prof. Dine Mitrov, PhD	
Purpose and objectives of the course program	**Theory classes of Herd Health Management** (HHM) course aim to familiarize students with the basic principles of managing herd health and production of livestock farms, as a separate veterinary service that is geared towards maximum expression of genetic potential of individual animal and the herd as a whole, by optimizing farm management and the overall position of the farm, consequently farm income. The student will need to know the principles of HHM, the way of settings the objectives and systematic strategies, record keeping, organize visits to farms under determined protocol, to be close to the epidemiological and economic aspects of the HHM; as well as to know the principles of monitoring and management of dry off period, milk production and metabolic diseases, reproductive performance, udder health, hoof health, control of infectious diseases. In this way the future doctor of veterinary medicine will be allowed to acquire knowledge of management of the health of the herd in order to assist farmers in optimizing health, production and welfare of	

	the animals in the herd. **Practicals of the course** have the task to train future DVM independently to manage the herd health and production on a farm, taking into account the individual segments of this process such as the management of reproduction, milk production, health of the hoof and udder, metabolic and infectious diseases, management of dry off period and overhaul of the herd. All this should be accomplished through practical exercises for setting the goals of the farm, training for proper record keeping and organizing visits to farms, perform the necessary clinical and laboratory testing, analysis and decision making based on information collected and finally monitoring the effects of the recommended intervention

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1-2	Basic principles, objectives and systematic strategies	Recordkeeping, visiting farms, epidemiological and economic aspects of the HHM
3-4	Monitoring of the overhaul the herd	Management of offspring, protocol of previously assigned goals
5-6	Monitoring the management in dry off period	Strategy before and during dry period. Physiological changes, disease, and prevention in the dry period
7-8	Monitoring of the milk production	Optimizing digestion in the rumen, metabolic diseases associated with rumen. Defining previously assigned goals, their implementation and monitoring.
9-10	Monitoring the reproductive performance	Goals, reproductive parameters, realization and decision-making and monitoring.
11-12	Monitoring the udder health	Purpose, pathobiology, protocol. Execution, decisions, analysis, treatment and monitoring.
13-14	Monitoring the hoof health	Objectives, protocol, completion, decisions, analysis, treatment and monitoring
15	Control of infectious diseases	Monitoring and control of BVDV, IBR / IPV, BRSV, leptospyrosis, paratuberculosis , salmonellosis, brucellosis, leucosis

PRACTICALS

No of lessons	***Teaching unit***	***Contents of teaching unit***
1	Basic principles, objectives and systematic strategies	Recordkeeping, visiting farms, epidemiological and economic aspects of the HHM
2-5	Monitoring of the overhaul the herd	Management of offspring, protocol of previously assigned goals
6-9	Monitoring the management in dry off period	Strategy before and during dry period. Physiological changes, disease, and prevention in the dry period
10-13	Monitoring of the milk production	Optimizing digestion in the rumen, metabolic diseases associated with rumen. Defining previously assigned goals, their implementation and monitoring.
14-17	Monitoring the reproductive performance	Goals, reproductive parameters, realization and decision-making and monitoring.
18-21	Monitoring of the udder health	Purpose, pathobiology, protocol. Execution, decisions, analysis, treatment and monitoring
22-25	Monitoring of the hoof health	Objectives, protocol, completion, decisions, analysis, treatment and monitoring
26-30	Control of infectious diseases	Monitoring and control of BVDV, IBR / IPV, BRSV, leptospirosis, paratuberculosis , salmonellosis, brucellosis, leukosis

Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 2 lessons a week (30 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practical work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**10**	**15**
Attendance and activity (knowledge) on practicals	**25**	**30**
Written assay (report)	**5**	**10**
Periodical evaluation	**20**	**45**
Total:	**60**	**100**

	Prerequisite criteria: For being able for gaining final grade mark, the student has gain up to 35 points from attendance on theory classes and practicals, to prepare one assay and to show appropriate activity and knowledge on the practicals.
Evaluation of knowledge	**Periodical evaluation:** oral, during the practical work. **Written assay:** preparation of a report for certain condition in the herd, with recommendation for corrective activities. **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. Brand A., J.P.T.M. Noordhuizen, Y.H, Schukken, 1997, Herd Health and Production management in daity practice, Wageningen Pers, The Netherland** **2.** Dovenski T. i sor., Menadzment zdravlja stada i proizvodnje u farmskom uzgoju mlecnih goveda, 6. Savetovanje iz klinicke patologije i terapije zivotinja "Clinica veterinaria" Zbornik radova, 204-210, Budva, SCG, 2004 **3.** Radostits O.M., Leslie K.E., Fetrow J., Herd Health - Food Animal Production Medicine , 2. edition., W.B. Saunders Company.

Course	**VETERINARY LEGISLATIVE**	**2.0 credit points**
Code	**FVM 520**	
Year of study	**Fifth**	
Semester	**Ninth (IX)**	
Total teaching lessons	**45 (30+ 15)**	
Course type	Compulsory	
Prerequisities		
Authors of the course program	prof. Risto Prodanov, PhD ass. Sloboden Chokrevski, MSc	
Realized by	prof. Risto Prodanov, PhD ass. Sloboden Chokrevski, MSc	
Purpose and objectives of the course program	**Definition of the course:** The course Veterinary Legislation is studying veterinary legislation and everything connected to the organization and activities of the veterinary profession. **Position the course in veterinary education:** Veterinary profession is legally regulated profession. For all segments of its activities, there are national and international systems, laws and standards. Through studies of Veterinary Legislation students are introduced to them, in order to be able to successfully engage in the work of various systems and areas covered by the veterinary medicine. **Relation of the course with previous and future education:** The subject Veterinary Legislation binds the knowledge acquired by the student in other courses in the areas of animals health, food safety, veterinary medicinal products, animal feed, animal welfare, etc… The course is essential for the further education and acquiring the status of an official and authorized veterinarian. **General objectives of the course:** The course objective of the Veterinary Legislation to introduce both students, as future official and authorized doctors of veterinary medicine in the legal system of the state, the principles of veterinary international and national legislation, the organization of veterinary services in the world, in EU and in Republic of Macedonia.	

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1,2,3	INTRODUCTION	Introduction to veterinary legislative. Constitution of the Republic of Macedonia, primary and secondary legislation in Republic of Macedonia.
4,5	PRIMARY LEGISLATION	Laws regulating the operation of administrative bodies, Law on Organization of Administrative Bodies, Law on General Administrative Procedure.
5,6,7,8	INTERNATIONAL VETERINARY ORGANIZATIONS AND	International standards in veterinary medicine and veterinary service organization at the international level: OIE, WTO SPS Agreement, *Codex alimentarius.*

	STANDARDS	
9,10,11,12	ORGANIZATION AND LEGISLATION IN EU AND HARMONISATION OF MACEDONIAN LEGISLATION	EU veterinary legislation (*Acquis comunitaire veterinaire*), institutions and organization of veterinary service in the EU and the process of harmonization of the Macedonian national legislation with the EU. Veterinary audit of international trading of animals and animal products.
13,14	MACEDONIAN NATIONAL LEGISLATION IN THE FIELD OF VETERINARY MEDICINE	Law on identification and registration of animals and accompanying bylaws. Introduction to animal identification and registration system. Rules on identification and registration of cattle, Rules on identification and registration of sheep and goats.
15,16,17,18	MACEDONIAN NATIONAL LEGISLATION IN THE FIELD OF VETERINARY MEDICINE	Law on Veterinary Health and accompanying regulations. Organization of veterinary service, rights and duties of the Minister of Agriculture, Director of Food and Veterinary Agency, Faculty of Veterinary Medicine, Veterinary Chamber, the official (state veterinary inspectors) and authorized veterinarians. Certification, authorizations and conditions. Organization of animal на health protection in Republic of Macedonia: a) especially dangerous disease which are subject of planning of prompt measures b) diseases with special importance and priority for the state and are subject of special monitoring and control programs c) diseases appearing on RM territory and are consequence of mode of accommodation, breeding and reproduction Conditions for putting animals, products and by-products of animal origin in market: control of animals, products and by-products of animal origin on the site of origin, and on the site of destination, monitoring networks, issuing of confirmations. Import, transit, re-export of animals, products and by-products of animal origin.
19,20	MACEDONIAN NATIONAL LEGISLATION IN THE FIELD OF VETERINARY MEDICINE	Law on welfare and protection of animals and accompanying regulations. System and concept of animal welfare according OIE and EU. Animal welfare on farm, during transport, during slaughtering and relation with food safety system. Welfare of animals in the zoos and laboratory animals. Animal protection.
21,22	MACEDONIAN NATIONAL LEGISLATION IN THE FIELD OF VETERINARY MEDICINE	Law on Food Safety and accompanying regulations. Concept of traceability and control of food of animal origin from field to fork. HACCP systems and their application. Organization and execution of veterinary control in different objects for production and processing of animal products.
23,24	MACEDONIAN NATIONAL LEGISLATION IN THE FIELD OF VETERINARY MEDICINE	Law on waste and by-products of animal origin and the accompanying bylaws. Veterinary protection and environment improvement. Classification and categorization of waste and by-products of animal origin and systems for collecting, processing and/or harmless removement.
25,26	MACEDONIAN NATIONAL LEGISLATION IN THE FIELD OF VETERINARY MEDICINE	Annual program for Animal Health on territory of Republic of Macedonia. Public domain measures (vaccinations, laboratory tests) included in Annual program for Animal Health, participants, obligations and implementation.
27,28,29,30.	MACEDONIAN NATIONAL LEGISLATION IN THE FIELD OF VETERINARY MEDICINE	Multiannual programs for combating various diseases on the territory of Republic of Macedonia: Program for combating and eradication of especially dangerous diseases in animals. Program for combating and eradication of transmissible spongiform encephalopathies. Program for combating and eradication of tuberculosis in cattle. Program for combating and eradication of brucellosis. Program for combating and eradication of bluetongue. Program for combating and eradication of aviary influenza.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1.	Examples of carrying out general administrative procedure.

2.	OIE International Code of Terrestrial and Code of Aquatic Animals, Manual of Standards for Laboratory Diagnostic Methods and Biologicals.
3.	Notification of diseases under OIE system and WAHIS. Information system for animal health status worldwide.
4.	Examples of directives, regulations and decisions in the EU concerning the veterinary field.
5.	Documents and resources for identification and registration of animals.
6.	Health certificates and documents the movement of animals.
7.	International veterinary certificates.
8. 9	Veterinary documents and regulations in slaughterhouses, dairies, processing facilities and all areas subject to veterinary control.
10.	Transport of animals.
11,12	Organization and documentation of measures covering annual program for animal health.
13	Organization, duties and responsibilities for the implementation of multi-annual programs to combat various diseases.
14,15.	Visual teaching methods, screening of films using information from the Internet

Organization	Theory classes: 2 lessons a week (30 lessons) Practicals: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**5**	**10**
Attendance and activity (knowledge) on practicals	**5**	**10**
Written assay	**5**	**10**
Periodical evaluations (two)	**30**	**50**
Final exam	**Oral exam 20**	
Total:	**60**	**100**

	* Besides attendance on theory classes and practicals additional condition for course teacher's signature at the end of the semester, is passing of periodical evaluations during the semester with minimum 30 points. * Final exam is oral. Student who did not pass one of the periodical evaluations during the semester, goes to one of the reparative evaluations during the exam sessions.
Evaluation of knowledge	**Periodical evaluations (two):** written First periodical evaluation – general part: International standards in veterinary medicine and veterinary service organization at the international level: OIE, WTO SPS Agreement, *Codex alimentarius*. EU veterinary legislation (*Acquis comunitaire veterinaire*), institutions and organization of veterinary service in the EU and the process of harmonization of the Macedonian national legislation with the EU. Second periodical evaluation – special part: Constitution of the Republic of Macedonia, primary and secondary legislation, laws regulating the operation of administrative bodies, the Law on General Administrative Procedure. Macedonian national legislation in the field of veterinary medicine. **Final exam:** oral **Complete final exam:** not predicted **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. ***Материјали од предавања и вежби*** Р. Проданов и С.Чокревски 2. ***Збирка закони од областа на ветеринарното здравство*** Управа за ветеринарсво МЗШВ 3. ***Terrestrial animal health code*** OIE 2008

	4. ***Основи на ветеринарномедицинското законодателсво и менаджмент*** И. Божков, А.Стојанов, К.Василев Факултет за ветеринарна медицина- Тракијски Универзитет, Стара Загора, Бугарија 5. www.oie.int 6. www.pravo.org.mk 7. http://vetlex.taiex.be/

Course	**FOOD SAFETY AND VETERINARY PUBLIC HEALTH**	**4.0 credit points**
Code	**FVM 521**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**60 (30+ 30)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Pavle Sekulovski, PhD	
Realized by	prof. Pavle Sekulovski, PhD ass. prof. Dean Jankuloski, PhD	
Purpose and objectives of the course program	**THEORY CLASSES**: Aim of this course is to introduce the students to the role of veterinary profession in food safety and veterinary public health. Students are teached food microbiology, food poisoning, food spoilage as well as European and national food legislation. Risk analysis and process control in food production with contemporary control systems. Role and duties of the official veterinarian in the control of spreading the diseases, hygiene of animals for slaughter, food processing and handling are explained. Longitudinal and integrated approach to the safe food production, animal welfare and influence of food to human health. **PRACTICALS.** Aim of the practicals is to train students to perform the duties of the official veterinarians. It includes all the official forms and documents used by the official veterinarians, sampling, packing and sending the samples to the official laboratory. Students are teached how to collect samples for the official monitoring programs for Salmonella, residues and contaminants in food of animal origin. Methods for testing of food and water microbiology are also included in this course.	

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1.	INTRODUCTION TO FOOD SAFETY AND VETERINARY PUBLIC HEALTH	Definitions. Importance and role of veterinary public health in protection of animal and human health. Food safety main principles.
2.	BASICS OF FOOD MICROBIOLOGY	General principles of microbial growth and survival. Dynamic microbial growth factors. Dynamic of microbial death. Interactions of factors involved in survival of microorganisms
3.	MICOBIOLOGICAL SPOILAGE OF FOOD	Food spoilage principles. Types of spoilage. Microorganisms involved. Control mechanisms and principles
4.	FOODBORNE INFECTIONS AND INTOXICATIONS	Pathophysiology of diarrhea, vomiting and abdominal pain. Foodborne infections – causes and symptoms. Foodborne intoxications – causes and symptoms.
5.	INVESTIGATION OF FOOD OUTBRAKES	Definition of food outbreak. Investigation of food outbreak. Cohort study. Case-control study.
6.	EUROPEAN AND NACIONAL FOOD LEGISLATION	European food legislation. Food safety law. Hygienic package from 2006. National laws
7.	COMPETENT AUTHORITY FOR FOOD – VETERINARY AND FOOD INSPECTION	Structure of food control system. Competent authorities and competencies. Role and duties of official veterinarian
8.	FOOD CHAIN AND HEALTH HAZARDS	Properties of food chain and health hazards
9.	HEALTH HAZARDS ORIGINATIONG FROM THE FARMS	Epidemiological principles implemented in veterinary public health Zoonoses in farm animals. Farm factors. By-products
10.	FOOD HYGIENE AND SAFETY AT RETAIL AND CONSUMER LEVEL	Retail – shops and supermarkets. Expire date of food products. Food labelling. Food catering. Safety at consumer level. Improper storage. Improper thermal treatment. Cross-contamination
11.	STABLE TO TABLE CONCEPT	LISA concept and its main elements

12.	PRP, SSOP, GHP, GMP	Pre-requisite programs. Standard sanitation operations procedures. Good manufacturing practice. Good hygiene practice
13.	HACCP SYSTEM	HACCP principles. Establishing, implementation and validation of HACCP system
14.	RISK ASSESMENT	Risk assessment. Hazard identification. Hazard characterisation. Exposition assessment. Risk characterisation. Risk analysis. Risk management. Risk communication
15.	RESIDUES AND CONTAMINANTS IN FOOD	Intro. EU Directive 96/23. Methods for detection and quantification. Monitoring and surveillance
16.	PROCESS CONTROL: SWAB SURFACE, WATER, CLEANING AND DESINFECTION	Food industry process control. Swab and surface sampling, interpretation of results. Water quality. Sampling water for analyses. Cleaning and disinfection. Control of efficiency of cleaning and disinfection
17.	FOOD PRODUCTION AND ENVIRONMENT PROTECTION	By-products, wastewater. Systems for wastewater treatment. Protection of the environment.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1.	Documentation used by official veterinarian
2.	Sampling and sending samples to laboratory for laboratory testing of: - control of process hygiene: surface swabs - safety of raw materials and final food products - water quality - national monitoring programmers - antimicrobial resistance
3.	- Swabs – enumeration of enterobacteriaceae, aerobic plate count
4.	- Food and raw materials – microbiological methods for detection Salmonella, Listeria monocytogenes, Campylobacter spp. Yersinia enterocolitica, Staph. aureus, E. coli
5.	- Water – membrane filtration methods, Ps. aeruginosa, E. coli, coliforms, intestinal enterococci, total viable count 22^0C, и 37^0C, determination of NO_2, NO_3, NH_3,
6.	- Sample preparation for detection of *Salmonella spp.,* mycotoxins, pesticides, heavy metals, hormones
7.	- Antimicrobial substances – screening methods - Delvo test, Copan test, Four Plate Test и quantitative determination with HPLC
8.	Elaboration of HACCP plan for - slaughterhouse for mammalian - slaughterhouse for poultry - dairy - meat processing factory

Organization	Theory classes: 2 lessons a week (30 lessons) Practicals: 2 lessons a week (30 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on practicals	**24**	**30**
Written assay	**5**	**10**
Periodical evaluations (two)	**10**	**20**
Final exam	**9**	**25**
Total:	**60**	**100**

Prerequisite criteria: For being able to pass the final exam student has to gain up to 45 points from theory classes and practicals and the two periodical evaluations. If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and

<table>
<tr><td></td><td>practicals, he/she has to go on complete final exam.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two): written
First periodical evaluation: - general part
Second periodical evaluation: - special part
Final exam: oral
Complete final exam: oral and written (includes one periodical evaluation)
Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>Бунчиќ, С. (2006) Integrated Food Safety and Veterinary Public Health
Eley, A. R. (1996) Microbial Food Poisoning
Garbutt, J. (1997) Essentials of Food Microbiology
Doyle, M.P., Beuchat, L.R., Montville, T.J.(2007) Food Microbiology: Fundamentals and Frontiers
Virginia N. Scott, Stevenson, K. E. (2006) HAACP A systematic approach to food safety</td></tr>
</table>

Course	**BIOLOGY AND PATHOLOGY OF GAME**	**2.0 credit points**
Code	**FVM 522**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30 (15+15)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	***The theory classes*** of biology and pathology of game course has aim to introduce students with the: term and meaning of hunting, Law for hunting in R. Macedonia, organization of hunting in Macedonia, place and role of veterinary service in hunting, types and characteristics of the hunting grounds, ways for game breeding, biological characteristics and diseases of hunting game, damages caused by game, games damages and basics of the hunting cynology. In this manner, the future doctor for veterinary medicine will be able to gain: knowledge for recognizing the specifics in manifestation of clinical and pathomorphological changes in game diseases, capability for advising and applying appropriate medication of diseases in bred game, ability for advising and taking preventative measures including promotion of optimal game health and modern hunting. ***The practicals*** of this course have aim to introduce students with systematic and categorizing of hunting game, feed and methods for supplement feeding of game, eradication of harmful game and safe removal of game corpses, hunting weapon and first aid, hunting trophies, determination of game diseases, handling of shot game and protection of game.	

Contents

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1.	DEFINITION AND MEANING OF HUNTING	Historical development of hunting. Law for hunting in R. Macedonia. Organization of hunting in Macedonia, place and role of veterinary service in hunting.
2-3.	HUNTING GROUNDS	Arranging of hunting grounds, scoring of hunting grounds, planning of yearly hunt, determining of the actual state of game in the hunting grounds, technical arrangement of the hunting ground
4-5.	GAME BREEDING	Factors that influence game breeding, basic methods of game breeding, basic methods in natural game breeding, artificial breeding of hunting game.
6.	CHARACTERISTICS OF GAME DISEASES	Diseases of hunting game as natural occurrence, causes for disease outbreak in game, prevention of spreading game diseases, measures

		for increasing game population after eradication of diseases, sanitary shooting.
7.	BIOLOGICAL CHARACTERISTICS OF GAME BIRDS	Great Bustard, capercaillie, ptarmigan, hazel grouse, pheasant, partridge, wall barley, pigeon, turtledove, sandpiper, goose, duck, auk, swan, coot, falcon, goshawk, milvus, eagle, vulture, owl, raven, crow, magpie
8.	GAME BIRDS DISEASES	Diseases with non-infectious, infectious and parasitic etiology
9.	BIOLOGICAL CHARACTERISTICS AND DISEASES OF WILD LEPORIDS AND RODENTIA	Rabbit, squirrel, ground squirrel, dormouse; Diseases with non-infectious, infectious and parasitic etiology
10.	BIOLOGICAL CHARACTERISTICS OF WILD RUMINANTS	Deer, doe, chamois, mouflon, ibex
11.	WILD RUMINANTS DISEASES	Diseases with non-infectious, infectious and parasitic etiology
12.	BIOLOGICAL CHARACTERISTICS AND WILD BOAR DISEASES	Diseases with non-infectious, infectious and parasitic etiology
13.	BIOLOGICAL CHARACTERISTICS AND WILD CARNIVORES DISEASES	Wolf, fox, jackal, lynx, wild cat, bear, marten, weasel, skunk, badger, otter Diseases with non-infectious, infectious and parasitic etiology
14.	DAMAGES TO AND FROM THE GAME	Damages to game by using pesticides and chemistry, damages caused by game and their regulation
15.	HUNTING CYNOLOGY	FCI breeds of hunting dogs

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1.	Systematic and categorization of hunting game
2.	Game feeding
3.	Eradication of harmful game and safe removal of game corpses
4.	Hunting weapon and first aid
5.	Hunting trophy
6.	Determining game's diseases
7.	Handling shot game
8.	Game protection
9.	Visiting Skopje's Zoo
10.	Visiting the Natural History Museum in Skopje
11-12.	Visiting peasantry
13.	Visiting breeding facility for wild ruminants
14-15.	Visiting hunting ground and National park

Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.

Specific recommendations related with teaching

The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student's activities:

Activity type	*Points*	
	minimum	*maximum*
Attendance on theory classes	**12**	**15**
Attendance on practicals	**12**	**15**
Written assay	**6**	**10**
First periodical evaluation	**15**	**30**
Second periodical evaluation	**15**	**30**
Total:	**60**	**100**

* With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam.
* Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gain minimal 60 points.

Evaluation of knowledge

Periodical evaluation (two): written

First periodical evaluation: definition and meaning of hunting, hunting grounds, game breeding, characteristics of game diseases, biological characteristics of game birds, game birds diseases, systematic and short review of hunting game's biology, game feeding, eradication of harmful game and safe removal of game corpses, hunting weapon and first aid, hunting trophy.

Second periodical evaluation: biological characteristics and diseases of wild leporids and rodents, biological characteristics of wild ruminants, wild ruminants diseases, biological characteristics and wild boar diseases, biological characteristics and carnivore's diseases, damages to and from the game, hunting cynology, determination of game's diseases, handling shot game, game protection.

Complete final exam: Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are:

Grade mark	*Points*
5	**to 59**
6	**60-68**
7	**69-76**
8	**77-84**
9	**85-92**
10	**93-100**

Final grade mark forming criteria:

Points	*Grade mark*
до 60	**5 (F)**
61-68	**6 (E)**
69-76	**7 (D)**
77-84	**8 (C)**
85-92	**9 (B)**
93-100	**10 (A)**

Basic teaching aids

1. **Закон за ловство на Р.Македонија**. Службен весник на РМ бр. 26 од 24.02.2009 год.
2. Лапчевиќ Е., Јакшиќ Б.: **Болести дивљачи, крзнашица и кунича.** Издавачко-Информативни центар студената Београд, Београд, 1976.
3. Трпков Б., Дончев И., Дроздовски И.: **Ловечки прирачник.** Сојуз на ловечки организации на Македонија, Скопје, 1978.
4. Трпков Б.: **Ловство**. Шумарски факултет Скопје, Скопје, 1989.

Course	**BIOLOGY AND PATHOLOGY OF BEES**	**2.5 credit points**
Code	**FVM 523**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**45 (15+30)**	

Course type	Compulsory
Prerequisities	
Author of the course program	prof. Misho Hristovski, PhD
Realized by	prof. Misho Hristovski, PhD
Purpose and objectives of the course program	***The theory classes*** of the biology and pathology of bees course has the aim to introduce students with: beekeeping and its importance, development of apiology and the api-technique, bee's products production, current state of apiculture in R. Macedonia, term and meaning of apipathology, systematic of bees, species and breeds of bees that are breed in the world and our country, structure of the bee colony, life of the bee colony throughout the year, breeding of bee communities, undesirable appearances in the bee family, producing bee products, characteristics of organic bee production, diseases of bees and bee's nests, pests and enemies of bees, bee's poisoning, applying modern drugs in apiculture and measures for prevention, control and eradication of diseases, pests and poisoning of bees. In this manner, the future doctor for veterinary medicine will be able to: gain knowledge for basic terminology of apiculture and bee production, recognize the main clinical and pathomorphological changes in diseases of bees and bee's nests, advise and apply appropriate medication for diseases in bees and bee nest, take preventative measures including promotion of optimal health and apicultural production. ***The practicals*** of biology and pathology of bees course have the aim to introduce students with development and function of individual members of the bee colony, anatomical and physiological characteristics of bees, the advantages and disadvantages of different types of nest sites, practical usage of tools and equipment for bees, formation of beehives, yearly schedule of management tasks in the beehive, the importance and performing the exam of bee colony, clinical and laboratory diagnostics of bee diseases and practical application of the means for prevention and control of diseases in bees and bee nest.

Contents

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1.	BEEKEEPING AND ITS MEANING	Historical development of beekeeping, development of the apiology and apitechnique, production of bee products, apiculture in R. Macedonia, term and meaning of apipathology.
2.	TAXONOMY OF BEES; BEE SPECIES AND BREEDS	Taxonomy of bees, Megapis Honey bee, Micrapis Honey bee, european-african honey bee, european breeds of hoeny bee.
3.	YEARLY LIFE CYCLE OF THE BEE COLONY	Autumn period and wintering of bees, bee's nest forming period, main bee's pasture period, period of natural swarming of bee's colonies, the period after swarming and main bee's pasture
4.	BREEDING OF BEE'S COLONIES	General description of swarming and causes for bee's swarming, preparation and duration of swarming, natural swarming, artificial swarming
5.	BREEDING, REPLACEMENT AND ADDING QUEEN BEES	Natural breeding of queen bees, artificial breeding of queen bees, the need for replacement and methods for adding queen bees
6.	UNDESIRABLE APPERIANCES IN THE BEE COLONY	Absence of queen bee and fake queen bees, silent replacement of queen bees, swarms escaping from hives, bee's heist
7.	BEE'S PASTURE AND BEE'S PRODUCTS	Nectar, pollen, honeydew, resins matters; Honey, beeswax, pollen (flower dust), propolis, royal jelly and bee's toxin
8.	ORGANIC BEEKEEPING	Characteristics of organic production of bee products and methods for production
9.	VIRAL DISEASES OF BEES	Chronic paralysis, satellite of the chronic paralysis virus, acute paralysis, sacbrood disease, black queen cell disease, X virus, deformed wing disease, cloudy wing disease, Kashmir bee disease, apis iridescent virus, slow paralysis virus, Arkansas virus, Egypt virus
10.	BACTERIAL DISEASES OF BEES	American foulbrood, European foulbrood, spyroplasmosis, mycoplasmosis, septicemia, Serratia marcescens, Bacillus pulvifaciens, Bacillus paraalvei, Pseudomonas fluorescens, Yersinia pseudotuberculosis, Hafnia alvei infections
11.	FUNGAL DISEASES OF BEES	Chalkbrood, Stonebrood, aspergilosis, nosemosis
12-13.	PARASITIC DISEASES OF BEES	Senoteniasis, amebosis, acarosis, varoosis, tropilelosis
14.	DISEASE WITH NON-	Dysentery, May disease;

	INFECTIOUS ETIOLOGY; QUEEN BEE DISEASES AND ANOMALIES; BEE'S ANOMALIES	Melanosis, nesting non-mature eggs (empty eggs), nesting non-fertile eggs, oviduct obstruction by sperm cells, genital channel obstruction by excrements, catalepsy, no developed queen bee, deformed wings, ovary hypoplasia, no developed oviducts, degenerative changes in old queen bees; Bisexuality, cyclopsy, albinism
15.	PESTS AND ENEMIES OF BEES AND BEE'S POISONING	Wax moths, bee lice, bee beetle, skull butterfly, ants, spiders, mice, wasp, hornet, birds, bear, frogs, lizards, snakes, bee wolf; Poisoning bees with chemical agents, poisoning bees on pasture (herbal poisons)

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1-2	Members of bee colony, development (metamorphosis) of bees
3-4	Bee's anatomy and physiology
5-6	Bees nests and tools and equipment
7-8	Bee hives
9-10	Examination of bee colonies
11-12	Working in beehive throughout the year
13-14	Field work at beehive
15-16	Field work at beehive
17-18	Diagnosis of bee's viral diseases
19-20	Diagnosis of bee's bacterial diseases
21-22	Diagnosis of bee's fungal diseases
23-24	Diagnosis of bee's parasitic diseases
25-26	Drug application in bees
27-28	Field work at beehive
29-30	Field work at beehive

Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 2 lessons a week (30 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** **Activity type** / **Points** (minimum / maximum): **Attendance on theory classes** 12 / 15 **Attendance on practicals** 12 / 15 **Written assay** 6 / 10 **First periodical evaluation** 15 / 30 **Second periodical evaluation** 15 / 30 **Total:** 60 / 100 * With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam. * Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.
Evaluation of knowledge	**Periodical evaluation (two):** written **First periodical evaluation**: Beekeeping and its meaning, systematics of bees, bee species and breeds, yearly life cycle of bee colony, breeding of bee colonies, management, replacement and adding of bee queens, undesirable appearance in the bee colony, bee products, organic bee keeping, members of the bee colony, development (metamorphosis) of bees, bee's anatomy and physiology, bee nests, bee tools and equipment, beehives, management tasks in the beehives throughout the year and examination of the bee colonies. **Second periodical evaluation**: Viral, bacterial, fungal and parasitic diseases of bees, diseases with non-infectious etiology, queen bee's diseases and anomalies, bee's anomalies, pests and enemies of the bees, bee's poisoning, diagnosis of bees and bee's colonies diseases and drug application in bees.

	Complete final exam: Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are: ***Grade mark*** / ***Points*** **5** / **to 59** **6** / **60-68** **7** / **69-76** **8** / **77-84** **9** / **85-92** **10** / **93-100** **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. Христовски М. и Цветковиќ А.: **Современа контрола на вароозата**. Факултет за ветеринарна медицина во Скопје, Скопје, 2009. 2. Христовски М. и Цветковиќ А.: **Болести, штетници и труења на пчелите**. Интерна скрипта. Факултет за ветеринарна медицина во Скопје, Скопје. 3. Христовски М.: **Пчеларството во 21 век.** Национален форум за заштита на животните на Македонија, Скопје, 2004. 4. Кипријановска Х., Наумовски М.: **Пчеларство.** Скопје, 2002. 5. Шљахов П.: **Пчеларство.** III поправено издание, Наша Книга Скопје, Скопје, 1990.

Course	**AVIAN DISEASES**	**6.5 credit points**
Code	**FVM 524**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**90 (45+45)**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Metodija Dodovski, PhD ass. Aleksandar Dodovski, MSc	
Realized by	prof. Metodija Dodovski, PhD ass. Aleksandar Dodovski, MSc	
Purpose and objectives of the course program	***Theory classes*** Basic aim of the course is providing students with necessary quantum of knowledge about health and diseases in domestic poultry and other birds reared for economic purposes. Special emphasize is given to familiarization and overcoming of basic principles of industrial poultry production, as well diagnostics, prevention and eradication of poultry diseases. ***Practicals*** Aim of the practical part is to provide students with proper way of breeding of poultry and the basics of clinical and laboratory investigation in order to achieve accurate diagnosis.	

Contents

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1-3	Introduction	Significance of poultry production. Situation of poultry production (domestic and international). Poultry reared for economic purposes. Classification of races. Significance and use of hybrids. Anatomical and physiological characteristics in poultry. Role and significance of the doctor of veterinary medicine in poultry production. Economic aspects of disease.
4-6	Breeding and technology	Incubation systems. Sanitary measures in incubation station. Intensive rearing of chicks. Rearing of broiler breeders and layer breeders. Technology of broiler production. Technology of table egg layers.

7-9	Hygienic and economic parameters	Hygienic parameters of houses and equipment. Organization on the farm with basic economic aspects. Calculation of production traits of eggs, meat, calculation of costs.
10-12	Basic principles of prevention of diseases	General prevention. Influence of genetic factors, nutrition, production technology and conditions of rearing. Specific prevention. Immunoprophylaxis, medication, diagnostics and biosecurity measures.
13-15	Nutrition of poultry	Poultry nutrition. Physiological and nutritional characteristics of poultry. Profitability of diet on the basis of feed input prices. Nutritional characteristics of certain feedstuffs.
16-18	Nutritional diseases	Nutritional diseases. Variations in feed and water intake. Deficiency of nutrients. Energetic activity of carbohydrates, fats and proteins. Diseases due to vitamins and minerals deficiency and errors in nutrition, hemorrhagic syndrome, perosis, fatty liver syndrome, uricosis, cage paralysis, exudative diathesis, muscular dystrophy, alimentary encephalomalacia, erosions of gizzard, round heart disease, monocytosis etc.
19-21	Poisonings	
22-30	Viral diseases	Avian encephalomyelitis, infectious bronchitis, infectious laryngotracheitis, leucosis, Marek disease, Newcastle disease, diphtheria and pox, duck virus enteritis, duck hepatitis, avian influenza, infectious bursal disease, chicken infectious anemia, infectious ceratoconjuctivitis.
31-39	Bacterial diseases	Colibacillosis, salmonellosis, pasteurellosis, coryza, streptococcosis, staphylococcosis, mycoplasmosis, CRD complex, necrotic enteritis, vibrial hepatitis in layers,
40-42	Fungal diseases	Aspergillosis, monilliasis, favus.
43-45	Parasitic diseases	Endoparasites: coccidiosis, ascaridosis, histomoniasis, singamosis, toxoplasmosis, helminthosis etc. Ectoparasites: malophagosis, dermanisiosis, scabies.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1-12	Technology of production of parent stocks, technology in incubation station, technology of production of table egg layers, technology of production of broilers.
13-15	Biosecurity measures on poultry farm
16-18	Vaccination in poultry production
19-21	Clinical and laboratory investigation of poultry
22-33	Laboratory methods for diagnosis of certain diseases
34-36	Chicken embryos as a tool in diagnostics
37-45	OIE listed disease

Organization	Theory classes: 3 lessons a week (45 lessons) Practicals: 3 lessons a week (45 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students). Practicals: practicals and other ways of work with smaller groups Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**9**	**10,5**
Attendance and activity (knowledge) on practicals	**9**	**10,5**
Written assay	**7**	**9**
Periodical evaluations (two)	**2x10 = 20**	**2x20 = 40**
Final exam	**15**	**30**
Total:	**60**	**100**

Prerequisite criteria: For being able to pass the final exam student has to gain up to 45 points from theory classes and practicals and the two periodical evaluations. If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.
Written assay: Evaluation concerns ability of the student for finding and using referent literature,

	the structure of the assay, relevance of the data presented and appropriance of the elaboration of the theme. If the assay does not fulfill these criteria, it would be sent back for further working or it would not be graded.
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation (theoretical part): Introduction, Breeding and technology, Hygienic and economic parameters, Basic principles of prevention of diseases, Nutrition of poultry, Nutritional diseases, Poisonings Second periodical evaluation (theoretical part): Viral diseases, Bacterial diseases, Fungal diseases, Parasitic diseases First periodical evaluation (practical part): technology in different phases of poultry production, biosecurity measures, vaccination, clinical and laboratory investigation of poultry Second periodical evaluation (practical part): laboratory methods for diagnosis of certain poultry diseases, chicken embryos as a tool in diagnostics, OIE listed disease **Final exam:** written or oral **Complete final exam:** written (includes one or two periodical evaluations) **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. Болести на живина - интерна скрипта - Методија Додовски 2. Disaeases of Poultry, 12th Edition, Y.M. Saif, Iowa, 2008 3. Перадарство - Јоже Немажиќ, Жељко Бериќ, Загреб, 1995 4. Живинарство - Борина Супиќ, Нико Милошевиќ, Тимотеј Чобиќ, Нови Сад, 1998 5. Вирусне болести животиња - Славко Цветниќ, Загреб, 1997 6. Вирусне болести живине 1 - Чедомир Русов, Београд, 1998 7. Болести живине - Љубомир Козиќ, Београд, 1978 8. Болести живине - поремеќаји исхране, Тодор Палиќ, Исидор Рајиќ, Зора Николиќ, Београд, 1994 9. Болести на живината - Методија Додовски, Тихомир Лукарев, во печат 10. Анатомија и физиологија на живината - Методија Додовски, Тихомир Лукарев, во печат 11. Одгледување и исхрана живината - Методија Додовски, Тихомир Лукарев, во печат

Course	**CLINICAL PRACTICE: PET ANIMALS**	**3.0 credit points**
Code	**FVM 611**	
Year of study	**Sixth (VI)**	
Semester	**Eleventh (XI)**	
Total teaching lessons	**Practical (terrain) teaching 75**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Toni Dovenski, PhD	
Realized by	prof. Toni Dovenski, PhD prof. Plamen Trojachanec, PhD ass. prof. Goran Nikolovski, PhD ass. prof. Jovana Stefanovska, PhD ass. Branko Atanasov, MSc ass. Ksenija Ilievska, MSc ass. Igor Dzhadzhovski, MSc ass. Kiril Krstevski, MSc ass. Irena Celeska, MSc	
Purpose and objectives of the	This course is realized by practical teaching on-the-field: with practical teaching in conditions of terrain practice. Students gain practical skills in reproduction, surgery, orthopedics, ophthalmology, internal	

course program	medicine, infectious and parasitic diseases. Teachers are supervising the students while working with live patients in small groups of 3 to 5. Students can be included in everyday veterinary work at veterinary clinic or another institution which practices veterinary medicine.
Organization	Practicals, 5 lessons a week (75 lessons), in groups of 5-8 students
Teaching methods	
Specific recommendations related with teaching	

Activity type	*Points*	
	minimum	*maximum*
Attendance and activity (knowledge) on terrain clinical practice	**25**	**50**
Making protocol of clinical examination of the patient	**25**	**50**
Total:	**50**	**100**

Evaluation of knowledge	Final grade mark is not predicted. Reached credits are made by evaluation of protocols of clinical examination of the patient.
Basic teaching aids	*Literature used from particular clinical disciplines included in the course.*

Course	**CLINICAL PRACTICE: FARM ANIMALS**	**3.0 credit points**
Code	**FVM 612**	
Year of study	**Sixth (VI)**	
Semester	**Eleventh (XI)**	
Total teaching lessons	**Practical (terrain) teaching 75**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Toni Dovenski, PhD	
Realized by	prof. Toni Dovenski, PhD prof. Plamen Trojachanec, PhD prof. Dine Mitrov, PhD ass. prof. Jovana Stefanovska, PhD ass. Branko Atanasov, MSc ass. Ksenija Ilievska, MSc ass. Igor Dzhadzhovski, MSc ass. Kiril Krstevski, MSc ass. Irena Celeska, MSc	
Purpose and objectives of the course program	This course is realized by practical teaching on-the-field: with practical teaching on livestock farms. Students gain practical skills in reproduction, surgery, orthopedics, ophthalmology, internal medicine, infectious and parasitic diseases. Teachers are supervising the students while working with live patients in small groups of 3 to 5. Students can be included in everyday veterinary work at the veterinary service of the livestock farms.	
Organization	Practicals, 5 lessons a week (75 lessons), in groups of 5-8 students	
Teaching methods		
Specific recommendations related with teaching		

Activity type	*Points*	
	minimum	*maximum*
Attendance and activity (knowledge) on terrain clinical practice	**25**	**50**
Making protocol of clinical examination of the patient	**25**	**50**
Total:	**50**	**100**

Evaluation of knowledge	Final grade mark is not predicted. Reached credits are made by evaluation of protocols of clinical examination of the patient.
Basic teaching aids	*Literature used from particular clinical disciplines included in the course.*

Course	**PRACTICE IN FOOD INDUSTRY FACILITIES**	**3.0 credit points**
Code	**FVM 613**	
Year of study	**Sixth (VI)**	
Semester	**Eleventh (XI)**	
Total teaching	**Practical (terrain) teaching 75**	

<table>
<tr><td>lessons</td><td></td></tr>
<tr><td>Course type</td><td>Compulsory</td></tr>
<tr><td>Prerequisities</td><td></td></tr>
<tr><td>Author of the course program</td><td>prof. Pavle Sekulovski, PhD</td></tr>
<tr><td>Realized by</td><td>prof. Pavle Sekulovski, PhD, ass. prof. Dean Jankuloski, PhD</td></tr>
<tr><td>Purpose and objectives of the course program</td><td>Practice in food industry facilities is course which is realized by practical teaching in slaughter houses and meet and milk industry facilities. Teachers are supervising the students while working in small groups of 3 to 5.</td></tr>
<tr><td>Organization</td><td>Practicals, 5 lessons a week (75 lessons), in groups of 5-8 students</td></tr>
<tr><td>Teaching methods</td><td></td></tr>
<tr><td>Specific recommendations related with teaching</td><td>
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance and activity (knowledge) on terrain practice</td><td>25</td><td>50</td></tr>
<tr><td>Making inspection protocols</td><td>25</td><td>50</td></tr>
<tr><td>Total:</td><td>50</td><td>100</td></tr>
</table>
</td></tr>
<tr><td>Evaluation of knowledge</td><td>Final grade mark is not predicted. Reached credits are made by evaluation of inspection protocols.</td></tr>
<tr><td>Basic teaching aids</td><td>Literature used from particular disciplines included in the course.</td></tr>
</table>

Course	**INDIVIDUAL PRACTICE OUTSIDE THE FACULTY**	**7.0 credit points**
Code	**FVM 614**	
Year of study	**Sixth (VI)**	
Semester	**Eleventh (XI)**	
Total teaching lessons	**210**	
Course type	Compulsory	
Prerequisities		
Author of the course program	prof. Plamen Trojachanec, PhD	
Realized by	prof. Plamen Trojachanec, PhD (coordinator)	
Purpose and objectives of the course program	The main purpose of the external practice is to enable the students to gain practical experience directly from veterinary practitioners and also to become familiar with their daily liabilities. At the same time, students are required to demonstrate appropriate knowledge and skills so they can apply them in a daily practice. Practical work is mainly individual, on different patients, accompanied by an authorized veterinary practitioner.	
Organization	The practice is performed without supervision by the faculty, in the presence of a veterinary practitioner, authorized by the faculty. The student during their practical work remarks all the activities in a workbook, and it's given to the coordinator. Veterinary practitioner must complete a form of activity of each candidate and submit it to the coordinator. The practice is carried out after the 10 semester as a graduation prerequisite.	
Teaching methods	Work in a field conditions under supervision of a veterinary practitioner.	
Specific recommendations related with teaching		
Evaluation of knowledge	Coordinator verifies the successfully performed practice by checking the workbook and completed form by authorized veterinary practitioner.	
Basic teaching aids	*Literature used from particular clinical disciplines included in the course.*	

TEACHING CONTENTS OF

ELECTIVE COURSES

<table>
<tr><td>Course</td><td>INTRODUCTION TO VETERINARY MEDICINE</td><td>1.5 credit points</td></tr>
<tr><td>Code</td><td colspan="2">FVM 001</td></tr>
<tr><td>Year of study</td><td colspan="2">First (I)</td></tr>
<tr><td>Semester</td><td colspan="2">Second (II)</td></tr>
<tr><td>Total teaching lessons</td><td colspan="2">15</td></tr>
<tr><td>Course type</td><td colspan="2">Elective</td></tr>
<tr><td>Prerequisities</td><td colspan="2"></td></tr>
<tr><td>Author of the course program</td><td colspan="2"></td></tr>
<tr><td>Realized by</td><td colspan="2">prof. Dino Chrchev, PhD</td></tr>
<tr><td>Purpose and objectives of the course program</td><td colspan="2">The aim of the course is to introduce the students with definition and meaning of the veterinary medicine and veterinary profession worldwide in general, as well as in our country.</td></tr>
<tr><td>Content overview</td><td colspan="2">Definition, subject and role of veterinary medicine and veterinary profession. Veterinary medicine as a profession. Historic development of veterinary and veterinary medicine. Development of veterinary education. History od veterinary medicine in Macedonia. Study of Faculty of Veterinary Medicine in Skopje. Veterinary companies and possibility of imployement of doctors of veterinary medicine.</td></tr>
<tr><td>Organization</td><td colspan="2">Theory classes: 1 lesson a week (15 lessons)
Written assay</td></tr>
<tr><td>Teaching methods</td><td colspan="2">Theory classes: lectures in large group
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td colspan="2">The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>5</td><td>15</td></tr>
<tr><td>Written assay</td><td>20</td><td>85</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>25</td><td>100</td></tr>
</table>
* Final exam is not predicted, except if student did not pass one of the periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td colspan="2">*Final exam: not predicted
Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td colspan="2">1. materials prepared by course teacher
2. Internet</td></tr>
</table>

<table>
<tr><td>Course</td><td>ENVIRONMENT PROTECTION</td><td>1 credit point</td></tr>
<tr><td>Code</td><td colspan="2">FVM 003</td></tr>
<tr><td>Year of study</td><td colspan="2">Second (II)</td></tr>
<tr><td>Semester</td><td colspan="2">Third (III)</td></tr>
<tr><td>Total teaching lessons</td><td colspan="2">15</td></tr>
<tr><td>Course type</td><td colspan="2">Elective</td></tr>
<tr><td>Prerequisities</td><td colspan="2"></td></tr>
<tr><td>Author of the course program</td><td colspan="2">prof. Misho Hristovski, PhD</td></tr>
<tr><td>Realized by</td><td colspan="2">prof. Misho Hristovski, PhD</td></tr>
<tr><td>Purpose and objectives of the course program</td><td colspan="2">The purpose of this course is students to gain closer knowledge of types and methods of environmental pollution through practicing routine veterinary work; Released contaminants by animal husbandry and animal industry and short introduction of ecological basic terminology.</td></tr>
<tr><td>Content overview</td><td colspan="2">Lectures:</td></tr>
</table>

<table>
<tr><td></td><td>
- Ecology - study subject and basic terms
- Organizations and institutions in the field of environmental protection
- Air pollution and protection
- Water pollution and protection
- Soil degradation and protection
- Solid waste
- Radioactive materials and environment
- Chemistry and environment
- Noise and environment
- Environment monitoring
- Animal husbandry and environment
</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Written assay</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the reference literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student's activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is not predicted, except if student did not pass one of the periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluation (two): written
First periodical evaluation: Ecology - basic terms, Pollution and protection of air, water and soil.
Second periodical evaluation: Solid waste, Influence of radioactive materials, chemistry and noise on the environment, Environment monitoring and animal husbandry and environment
*Final exam: oral or written (includes one periodical evaluation)
Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>3. Мулев М.: Заштита на животната средина, Ворлдбук - Скопје, 1997
4. Extracts from the referent literature
5. Internet</td></tr>
</table>

Course	**ANIMAL ECOLOGY**	**2 credit points**
Code	**FVM004**	
Year of study	**Second (II)**	
Semester	**third (III)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	

<table>
<tr><td>Realized by</td><td>prof. Misho Hristovski, PhD</td></tr>
<tr><td>Purpose and objectives of the course program</td><td>Introduction with ecology basic terminologies, emphasizing animal ecology. Studying interrelations of animals and biotic and abiotic factors of the ecosystems. Through this subject students will be introduced with basic mechanisms of Ecophysiology (biological rhythm, diapause, hibernation etc.), as well as definition of the terms population and biocenosis and their interactions, finalizing with ecological characteristics of different living environments and their anthropogenic pollution.</td></tr>
<tr><td>Content overview</td><td>
THEORY CLASSES:
<table>
<tr><th>Teaching unit</th><th>Contents</th></tr>
<tr><td>Ecology – definition and categorization</td><td>Historical development, definition and categorization of ecology, Relationship between ecology and other disciplines</td></tr>
<tr><td>Environment</td><td>Biotope - basic terms</td></tr>
<tr><td>Biotic systems</td><td>Distribution of life organisms in the biosphere, Organization of biosphere and bio – geochemical cycles</td></tr>
<tr><td>Living conditions and meaning of ecological factors</td><td rowspan="2">General principals of influence of the ecological factors on living organisms; Abiotic factors (light, temperature, air); Biotic factors
Phenology events, Biological rhythm and its classification, Diapause, Winter and summer hibernation</td></tr>
<tr><td>Ecophysiology</td></tr>
<tr><td>Basic biotic systems and their functional characteristics</td><td>Population, biocenosis, ecosystem</td></tr>
<tr><td>Biodiversity</td><td>Basic principles</td></tr>
<tr><td>Living environment for organisms</td><td>Water as living environment</td></tr>
<tr><td>Living environment for organisms</td><td>Air as living environment</td></tr>
<tr><td>Living environment for organisms</td><td>Soil as living environment</td></tr>
<tr><td>Anthropogenic influence on living environment</td><td>Atmospheric pollution and protection</td></tr>
<tr><td>Anthropogenic influence on living environment</td><td>Water pollution and protection</td></tr>
<tr><td>Anthropogenic influence on living environment</td><td>Soil and food pollution and protection</td></tr>
<tr><td>Radioactive contamination</td><td>Radiation and its influence on living organisms< Sources and types of radiation</td></tr>
<tr><td>Ecology – definition and categorization</td><td>Historical development, definition and categorization of ecology, Relationship between ecology and other disciplines</td></tr>
</table>
PRACTICALS:
<table>
<tr><th>Title of the practical</th></tr>
<tr><td>Ecology – meaning and objectives</td></tr>
<tr><td>Living environment – practical examples</td></tr>
<tr><td>Bio-geochemical cycles</td></tr>
<tr><td>General principles of ecological factors influence on living organisms</td></tr>
<tr><td>Abiotic factors – examination and influence</td></tr>
<tr><td>Biotic factors – examination and influence</td></tr>
<tr><td>Action mechanism of ecophysiological events</td></tr>
<tr><td>Population, biocenosis and ecosystem</td></tr>
<tr><td>Evolutionary processes as factors in the biodiversity (Natural selection, adaptation, mutation and species distinction as natural process)</td></tr>
<tr><td>Physical – chemical properties and quality of water and soil as living environments</td></tr>
<tr><td>Physical – chemical properties and quality of air and light as living environments</td></tr>
<tr><td>Distribution of some biomes in the world</td></tr>
<tr><td>Detecting the pollution level and protection of the atmosphere</td></tr>
<tr><td>Detecting the pollution level and protection of the water and soil</td></tr>
<tr><td>Determining the level of radioactive contamination in the environment</td></tr>
</table>
</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Practicals: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active</td></tr>
</table>

	participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**

Activity type	*Points*	
	minimum	*maximum*
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on seminars	**12**	**15**
Written assay	**6**	**10**
Periodical evaluations (two)	**15(x2)=30**	**30(x2)=60**
Final exam	**not predicted***	
Total:	**60**	**100**

* Final exam is not predicted, except if student did not pass one of the periodical evaluations.

Evaluation of knowledge и оценување	**Periodical evaluation (two):** written First periodical evaluation: Ecology, living environment and biotic systems, living conditions and ecological factors and ecophysiology Second periodical evaluation: Functional characteristics of biotic systems, ecological characteristics of living environments and anthropogenic pollutions of the environment ***Final exam:** oral or written (includes one periodical evaluation) **Final grade mark forming criteria:**

Points	*Grade mark*
do 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. Паповиќ Р., Шапкарев Ј.: Анимална Екологија, Белград 1985 2. Extracts from the referent literature 3. Internet

Course	**ECOTOXICOLOGY**	**2 credit points**
Code	**FVM 005**	
Year of study	**Second (II)**	
Semester	**Third (III)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	Introduction with basic principles, studying object, problems and approach to ecotoxicology resulting of emission of dangerous chemical matters in the living environment by human. Analyzing changes in the ecosystems resulting of released toxins in nature through practical examples and models. Final, ecological approach in risk assessment and management of toxicological pollutions prevention.	
Content overview	**Lectures:** - Ecotoxicology – problems and recommendations - Ecosystem's response on chemical stress - Effects of chemical stress on aquatic species - Effects of chemicals on the structure of terrestrial ecosystems - Methods and models in ecotoxicology (methodological aspects, biostatistics models)	

<table>
<tr><td></td><td>- Bioaccumulation of hydrophobic organic pollutants
- Chemical stress on the living environment with carbon and phosphorus bio-geochemical cycles
- Biomonitoring
- Ecotoxicology legislation and management</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.
Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is not predicted, except if student did not pass one of the periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluation (two): written
First periodical evaluation: Basic principles of ecotoxicology, chemical stress and ecosystem’s reaction, Influence of chemical stress on aquatic and terrestrial ecosystems
Second periodical evaluation: Methods and models in ecotoxicology, Bioaccumulation of hydrophobic organic pollutants, Chemical stress and bio-geochemical cycles, Biomonitoring and ecotoxicology legislation.
*Final exam: oral or written (includes one periodical evaluation)

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Levin A. S., Harwell A. M., Kelly R. J., Kimball D. K.: Ecotoxicology: Problems and Approaches. Springer – Verlag New York Inc, 1989
2. Extracts from the referent literature
3. Internet</td></tr>
</table>

Course	**CHEMISTRY OF NATURAL COMPOUNDS**	**2 credit points**
Code	**FVM 006**	
Year of study	**Second (II)**	
Semester	**Third (III)**	
Total teaching lessons	**30 (1 + 1)**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Zehra Hajrulai-Musliu, PhD	
Realized by	prof. Zehra Hajrulai-Musliu, PhD	
Purpose and objectives of the course program	**Theory classes:** As one of the biggest parts of the science of food chemistry, aims to familiarize students with the role and significance the composition and properties of nutritional components, chemical changes that affect during storage and preparation process; introduction to nutritional value, quality and safety of foods are so understanding that the quality and safety of food depends on the chemical and physical processes.	

	Brief curriculum: A brief review of natural organic compounds. Origin and diversity of natural organic compounds. General methods for their isolation: crystallization, chromatographic methods, methods of extraction, distillation with water vapour, etc.. Glycosides. Creating and hydrolysis of glycosides. Activation and coupling-synthesis of peptides on solid phase. Some specific linear and cyclic peptides and proteins. Terpenoids. Common routes of biogenesis. Determining the structure of terpenoids. Monoterpenoids. Diterpenoids. Triterpenoids. Tetraterpenoids. Poliizoprenoids. Saponins. Phytosterols. Stereochemistry, biosynthesis, chemical synthesis and transformations. Lipids. Structure of fatty acids. Biosynthesis. Chemical synthesis. Prostaglandins. Structure, biosynthesis and synthesis. Thromboxane and leukotrienes. Polyphenols. Structural types. Presence in nature. Isolation and determination of the structure. Biosynthesis. Laboratory synthesis. Alkaloids. Structural features. Presence in nature. Isolation and determination of the structure. Biosynthesis. Alkaloids of ornithine and lysine. Alkaloids from phenilalanin and tyrosine. Alkaloids from tryptophan. Synthesis of alkaloids. Plant pigments. **Practicals:** Chromatographic techniques. Continuous extraction of natural material. Isolation of lactose from milk. Isolation of glycosides from natural materials. Peroxidation in animal fat. Extraction of essential oils. Isolation of phenolic compounds from grapes. Extraction of alkaloids: piperin of pepper. Nicotine from tobacco, caffeine from coffee. Plant pigments: isolation of β-carotene than carrots.

THEORY CLASSES

No of lessons	***Teaching unit***	***Contents of teaching unit***
1.	Introduction in Chemistry of Natural Compounds	A brief review of natural organic compounds. Origin and diversity of natural organic compounds.
2.	Methods of isolation of natural compounds	General methods and their isolation: crystallization, chromatographic methods, methods of extraction, distillation with water vapour, etc.
3.	Natural resources and function of glycosides and peptides	Glycosides. Creating and hydrolysis of glycosides. Saponins. Activation and coupling-synthesis of peptides on solid phase. Some specific linear and cyclic peptides and proteins.
4.	Natural resources and function of terpenoids	Terpenoids. Common routes of biogenesis. Determining the structure of terpenoids. Mono-terpenoids. Diterpenoids. Triterpenoids. Tetraterpenoids. Poliizoprenoids. Chemical rancid.
5.	Plant sterols	Phytosterols. Stereochemistry, biosynthesis, chemical synthesis and transformations. Lipids. Structure of fatty acids. Biosynthesis. Chemical synthesis.
6.	Prostaglandins, leukotrienes and tromboxane	Prostaglandins. Structure, biosynthesis and synthesis. Leukotrienes and tromboxane
7.	Polyphenols	Polyphenols. Structural types. Presence in nature. Isolation and determination of the structure. Biosynthesis. Laboratory synthesis.
8.	Alkaloids and pigments	Alkaloids. Structural features. Presence in nature. Isolation and determination of the structure. Biosynthesis. Alkaloids of ornithine and lysine. Alkaloids from phenylalanine and tyrosine. Alkaloids from tryptophan. Synthesis of alkaloids. Plant pigments.

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1.	Types of extraction of natural material
2.	Isolation of lactose from milk
3.	Isolation of glycosides from natural materials
4.	Peroxidation in animal fat
5.	Extraction of essential oils
6.	Isolation of phenolic compounds from grapes
7.	Extraction of alkaloids: piperin of pepper. Nicotine from tobacco, caffeine from coffee
8.	Plant pigments: isolation of β-carotene than carrots

Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students).

<table>
<tr><td></td><td>Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student's activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Besides attendance on theory classes and practicals additional condition for course teacher's signature at the end of the semester, is passing of periodical evaluations during the semester with up to 25% points gained per evaluation.
* Final exam is not predicted. Student who did not pass one of the periodical evaluations during the semester goes to one of the periodical evaluation during the exam sessions.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two): written
First periodical evaluation: - general part
Second periodical evaluation: - special part
Final exam: not predicted
Complete final exam: not predicted
Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. J. Mann, R.S. Davidson, J.B. Hobbs, D.V. Banthorp, J.B. Harborne: Natural products - their chemistry and biological significance, Longman, London, 1994;
2. M. Miloš, P.M. Dewick, Medicinal natural products - a biosynthetic approach, John Wiley & Sons, New York, 1997;
3. Prirodni organski spojevi, interna skripta, KTF Split, u tisku;
4. V. Rapić, Postupci priprave i izolacije organskih spojeva, Školska knjiga, Zagreb, 1994.</td></tr>
</table>

Course	**ANATOMY OF EXOTIC AND LABORATORY ANIMALS**	**3 credit points**
Code	**FVM 007**	
Year of study	**Second (II)**	
Semester	**Third (III)**	
Total teaching lessons	**45**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Vlatko Ilieski, PhD ass. prof. Lazo Pendovski, PhD	
Realized by	prof. Vlatko Ilieski, PhD ass. prof. Lazo Pendovski, PhD	
Purpose and objectives of the course program	Studying the structure and functional anatomy of the exotic and laboratory animals. The program takes all of the aspects of the anatomy of the animals, witch are prerequisites for their husbandry and nutrition. This program corresponds with the needs of future veterinarians for their education and knowledge whose they will implement in the animal welfare law and regulations.	
Content overview	Anatomy of the exotic animals Using radiograms in the exotic animal diseases diagnosis. Anatomy of mouse Anatomy of ferret Anatomy of chicken (2 presentations) Anatomy of song bird Anatomy of pigeon	

<table>
<tr><td></td><td>Anatomy of ostrich
Anatomy of green iguana
Anatomy of snake
Anatomy of tortoise
Anatomy of frog
Anatomy of fish
Lecture material: Presentations, CLIVE computer interactive program (quizzes): Anatomy of amphibians and snakes, Working with fresh, fixated and plastinated materials.</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lessons a week (15 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.
Use of plastinated models and educative video materials.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.
Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is not predicted, except if student did not pass one of the periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluations (two): written
First periodical evaluation: basic anatomy of exotic and laboratory animals
Second periodical evaluation: cases from clinical practice

*Final exam: oral or written (includes one periodical evaluation)

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. materials prepared by course teachers
2. Extracts from the referent literature
3. Internet</td></tr>
</table>

Course	**PROTECTION AND MANAGEMENT WITH ENDANGERED ANIMAL SPECIES**	**2 credit points**
Code	**FVM 008**	
Year of study	**Second (II)**	
Semester	**Fourth (IV)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and	Introduction of students with methods and means of protection in endangered animal species and	

<table>
<tr><td>objectives of the course program</td><td>meaning of biodiversity. This course allows information for endangered animal species in Republic of Macedonia and including students for preparation of projects which ensure constant protection of particular endangered species. Before including in this type of projects, students will have opportunity to introduce with biological features for certain species of animal with designing appropriate measures to protect. Prepared projects will form the basis for further implementation of the same within the Faculty, involvement of students who have made the appropriate project.</td></tr>
<tr><td>Content overview</td><td>Theory classes:
World strategy for protection of biodiversity
General principles for protection of endangered animal species (genetic banks, reserve, breeding in captivity, reintroduction etc.)
Endangered animal species in Republic of Macedonia - biological features and current status number
Practicals:
Work in groups (6-8 students) and preparation of project for protection of endangered animal species in Republic of Macedonia.
Define project and choice theme
Scientific-researching work- biological features of target animal species
Scientific-researching work- practical methods and measures for protection of target animal
Visiting and choice of an appropriate location for realization of provided project
Preparing of action and time plan for implementation of the project
Financial construction of the project
Making of the final project
Making final presentation of the project and next steps</td></tr>
<tr><td>Organization</td><td>Theory classes: 6 lessons
Practicals: (preparation of a project): 24 lessons
Total: 2 lessons a week (30 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in group with discussion and active participation of the students)
Preparation of a project in groups of 6-7 students.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.
Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes and predicted activities</td><td>12</td><td>15</td></tr>
<tr><td>Preparation of a project</td><td>48</td><td>85</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is not predicted and scoring is based on activity shown by the student during the preparation of the project.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Documents and literature from appropriate institutions in RM
2. Extracts from the referent literature, Internet</td></tr>
</table>

Course	**PRODUCTION OF BULKY FEED**	**2 credit points**
Code	**FVM 009**	
Year of study	**Second (II)**	
Semester	**Fourth (IV)**	
Total teaching lessons	**30 (15+15)**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Risto Prodanov, PhD	
Realized by	prof. Risto Prodanov, PhD	

<table>
<tr><td></td><td>ass. Radmila Chrcheva-Nikolovska, MSc</td></tr>
<tr><td>Purpose and objectives of the course program</td><td>Aim of the course Production of bulky feed is to familiarize students and future veterinary specialists (with main occupation intensive animal breeding) with general characteristics of plants used in animal nutrition, their nutritional value, their digestive and biological value, as well as the way of preparing voluminous (bulky) feed, for expedient and rational settlement needs in domestic animals.
A contribution it that direction would be introduction of newest varieties and hybrids of forage plants, their growth needs, the basics of production technology – new technological solutions, such as crop rotation, type and soil manipulation, utilization of various fertilizers, seeds, sowing, cultivation, protection etc.
The ultimate goal of the course Production of bulky feed is, with proper nutrition of animals, to influence on quantitative and qualitative gain of safe animal feed, i.e. food for man (meat, milk, eggs).</td></tr>
<tr><td>Content overview</td><td>• Introduction to feed base
• Chemical composition of plants (essentiality of certain substances that are important in the diet of domestic animals)
• Influence of the composition of the soil to produce forage plants
• The impact of agrotechnical measures for the production of forage plants
• Cultivating and goals in cultivating feed crop in crop rotation
• The role and importance of green forage „конвеер“
• Forage plants of arable land
• Cereals – as forage plants
• Annual pods
• Perennial pods
• Rootstock and tuberous plants
• Other forage plants
• Forage plants of meadows and pastures
• Preparation, preservation and storage of feed
• Preparation of hay
• Preparation of haylage
• Preparation of silage
• Preservation of feed by dehydration (flour, briquettes, pellets)
• Assessment of the quality of feed</td></tr>
<tr><td></td><td>Theory classes: 1 lesson a week (15 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of an teaching unit by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.
Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is not predicted, except if student did not pass one of the periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluations (two): written
First periodical evaluation: types, quality and application of forage feed
Second periodical evaluation: preservation and application of feed

*Final exam: oral or written (includes one periodical evaluation)

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<tr><td>to 59</td><td>5 (F)</td></tr>
</table></td></tr>
</table>

60-68	6 (E)
69-76	7 (D)
77-84	8 (C)
85-92	9 (B)
93-100	10 (A)

Basic teaching aids	1. Ивновски П., Фуражно производство, Скопје 2000; 2. Блажевиќ Ж и Грдовиќ С, Крмно биље, Београд-2003; 3. Бучковиќ С., Крмно биље, Београд-1999; 4. Проданов Р., Исхрана на домашните животни-општ дел (скрипта-материјал за интерна употреба); 5. Каливода М., Крмива, Загреб -1990; 6. Џукиќ Д., Биљке за производњу сточне хране, Нови Сад - 2002

Course	**ZOOLOGY OF WILDLIFE**	**2 credit points**
Code	**FVM 010**	
Year of study	**Second (II)**	
Semester	**Fourth (IV)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	The aim of the course is to introduce the students with the basics of biological characteristics of wildlife in Republic of Macedonia. The lectures include the role of wildlife in the ecosystem, systematic, biological characteristics and conservation methods of wildlife.. During the seminars the types of wildlife in Republic of Macedonia will be examined in groups.	
Content overview	• The role of wildlife in the ecosystem • Taxonomy and division of wildlife. • Biological characteristics of wildlife in Republic of Macedonia. - wild fowl - wild leporides and rodents - wild hoofed animals - wild carnivores • Endangered species • Measures of protection of wildlife	
Organization	Theory classes: 1 lesson a week (15 lessons) Seminars: 1 lesson a week (15 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.	
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**	

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance on seminars	**12**	**15**
Written assay	**6**	**10**
First periodical evaluation	**15**	**30**
Second periodical evaluation	**15**	**30**
Total:	**60**	**100**

* With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam.

	* Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.
Evaluation of knowledge и оценување	**Periodical evaluation (two):** written **First periodical evaluation:** The role of wildlife in the ecosystem, Taxonomy and division of wildlife, Biological characteristics of wild leporides and rodents. **Second periodical evaluation:** Biological characteristics of wild hoofed animals, wild carnivores, Endangered species, Measures of protection of wildlife. **Complete final exam:** Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are:

Grade mark	*Points*
5	**to 59**
6	**60-68**
7	**69-76**
8	**77-84**
9	**85-92**
10	**93-100**

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. **Закон за ловство на Р.Македонија**. Службен весник на РМ бр. 26 од 24.02.2009 год. 2. Трпков Б., Дончев И., Дроздовски И.: **Ловечки прирачник.** Сојуз на ловечки организации на Македонија, Скопје, 1978. 3. Трпков Б.: **Ловство**. Шумарски факултет Скопје, Скопје, 1989. 4. Hawksworth L.D. and Bull T.A.: **Biodiversity and Conservation in Europe**. Springer, 2008. 5. Hawksworth L.D. and Bull T.A.: **Vertebrate Conservation and Biodiversity**. Springer, 2007. 6. **Grzimek's Animal Life Encyclopedia – Birds**. Thomson-Gale, 2003. 7. **Grzimek's Animal Life Encyclopedia – Mammals**. Thomson-Gale, 2004.

Course	**WELFARE OF FISH**	**2 credit points**
Code	**FVM 011**	
Year of study	**Second (II)**	
Semester	**Fourth (IV)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	The aim of course is to obtain theoretic basis to the students about welfare of fish in extensive production. Theory classes include main aspects about welfare of animals and fish, stress reaction impact, impact of environment abiotical and biotical factors, aquacultural production and disease on welfare of fish. During the seminars, various problems from the modern aquacultural production from aspect of welfare of fish would be elaborated.	
Content overview	• Welfare of animals • Welfare of fish • Stress reaction in fish • Pain and fear in fish	

<table>
<tr><td></td><td>

Suffering in fish
Fish welfare legislative
Breeding practice and welfare of fish
Flock density and welfare of fish
Fins injuries in breeded fish
Water quality and welfare of fish
Transport and welfare of fish
Implications of diseases and drugs on welfare on fish
Deformities in fish and welfare
Fishing and welfare of fish
Welfare of ornamental fish species

</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:

<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>First periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Second periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>

* With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam.
* Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluation (two): written

First periodical evaluation: Welfare of animals, Welfare of fish, Stress reaction in fish, Pain and fear in fish, Suffering in fish, Fish welfare legislative, Breeding practice and welfare of fish, Flock density and welfare of fish.
Second periodical evaluation: Fins injuries in breeded fish, Water quality and welfare of fish, Transport and welfare of fish, Implications of diseases and drugs on welfare on fish, Deformities in fish and welfare, Fishing and welfare of fish, Welfare of ornamental fish species
Complete final exam: Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam’s grade marks are:
<table>
<tr><th>Grade mark</th><th>Points</th></tr>
<tr><td>5</td><td>to 59</td></tr>
<tr><td>6</td><td>60-68</td></tr>
<tr><td>7</td><td>69-76</td></tr>
<tr><td>8</td><td>77-84</td></tr>
<tr><td>9</td><td>85-92</td></tr>
<tr><td>10</td><td>93-100</td></tr>
</table>

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table>
</td></tr>
</table>

		77-84	**8 (C)**
		85-92	**9 (B)**
		93-100	**10 (A)**
Basic teaching aids	1. Branson J.E.: **Fish Welfare.** Blackwell Publishing Ltd, 2008.		

Course	**BEEKEEPING**	**2 credit points**
Code	**FVM 012**	
Year of study	**Second (II)**	
Semester	**Fourth (IV)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	The aim of the course is to introduce the students with the basic knowledge of modern production of bee products. The lectures include the meaning of beekeeping and the basic systematic and biological characteristics of the honey bee, beekeeping, bee hives and the necessary beekeeping tools and equipment, the technological procedures which should be used to have organic certified bee products and bee health protection. During the seminars the students will have practical insight in the procedures of modern production of bee products.	
Content overview	• Meaning of beekeeping • Taxonomy and types and of bees • Members of the bee family • Biological characteristics of the honey bee • Starting the beekeeping • Beehives, tools and equipment for beekeeping • Beekeeping technology • Honey giving plants • Bee products • Health protection of bees	
Organization	Theory classes: 1 lesson a week (15 lessons) Seminars: 1 lesson a week (15 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.	
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**	

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance on seminars	**12**	**15**
Written assay	**6**	**10**
First periodical evaluation	**15**	**30**
Second periodical evaluation	**15**	**30**
Total:	**60**	**100**

* With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam.
* Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.

Evaluation of knowledge и оценување	**Periodical evaluation (two):** written **First periodical evaluation:** Meaning of beekeeping, Taxonomy and types and of bees, Members of the bee family, Biological characteristics of the honey bee, Starting the beekeeping. **Second periodical evaluation:** Beehives, tools and equipment for beekeeping, Beekeeping technology, Honey giving plants, Bee products, Health protection of bees **Complete final exam:** Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are: ***Grade mark*** / ***Points*** **5** / **to 59** **6** / **60-68** **7** / **69-76** **8** / **77-84** **9** / **85-92** **10** / **93-100** **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. Христовски М. и Цветковиќ А.: **Современа контрола на вароозата**. Факултет за ветеринарна медицина во Скопје, Скопје, 2009. 2. Христовски М.: **Пчеларството во 21 век.** Национален форум за заштита на животните на Македонија, Скопје, 2004. 3. Киприjановска Хрисула, Наумовски М.: **Пчеларство.** Скопје, 2002.

Course	**ECONOMICS AND ORGANIZATION OF LIVESTOCK PRODUCTION**	**3 credit points**
Code	**FVM 013**	
Year of study	**Second (II)**	
Semester	**Fourth (IV)**	
Total teaching lessons	**45**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Blagica Sekovska, PhD prof. Mihajlo Adamov, PhD	
Realized by	prof. Blagica Sekovska, PhD prof. Mihajlo Adamov, PhD ass. Nikola Adamov, MSc	
Purpose and objectives of the course program	***Theory classes***. In the second year of curriculum of veterinary medicine the courses Husbandry and Rural economy are included as compulsive courses, so Economy and organization of livestock production is upgrade of both courses and logical extension of knowledge, especially for student who would work with farm production. Aim of this course is introduction with characteristics of an farm company, characteristics of farm breeding of different animal species: cattle, sheep and goats, pig and poultry. All particular characteristics of these productions would be elaborated both from organizational-technical and economic aspect. Also this course would obtain to the student getting sense about his/her responsibility as a part of a national economy, as well as the place and role of the veterinary profession in the total economy. **The practicals** have to obtain support to the theory classes and to provide additional elaboration of some topics from the practical aspect, via different teaching methods, as dramatization of some hypothetic situations and problem solving, making different economic analyses about the economic benefits of the company as the risk analysis, cost-benefit analysis, discussions on some topics interesting for the students etc. Practicals include also the visit of a company in rural region where some of the principles elaborated in the theory classes would be demonstrated practically.	

THEORY CLASSES

Organization	Theory classes: 2 lessons a week (30 lessons) Practicals: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) Practicals: practicals with a visit of a farm. Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** *One evaluation is graded by the one teacher, and the other one by the other teacher. Final grade mark is main of the two evaluations, but on student request exam can be also oral.

Activity type	*Points*	
	minimum	*maximum*
Attendance on theory classes	**8**	**12**
Attendance and activity (knowledge) on practicals	**12**	**14**
Written assay	**10**	**14**
Periodical evaluations (two)	**15(x2)=30**	**30(x2)=60**
Final exam	**/**	
Total:	**60**	**100**

Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation: - Економски аспекти Second periodical evaluation: - Организациони аспекти **Final exam:** on student's request **Complete final exam:** not predicted **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. Тодор Тодоров: Економија, економика, Organization, Скопје, 2001 2. Светислав Антиќ: Економика и Organization сточарске производње, Београд

Course	**DIVERSITY AND PROTECTION OF WILD CARNIVORES**	**2 credit points**
Code	**FVM 014**	
Year of study	**Third (III)**	
Semester	**Fifth (V)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	The aim of the course is to introduce the students with the basic knowledge for protecting wild carnivores. The lectures include the meaning of wild carnivores, taxonomy and biological characteristics of wild carnivores and measures for conservation of wild carnivores. During the seminars various programs for wild carnivores protection will be studied.	
Content overview	• Meaning of wild carnivores to the ecosystem • Taxonomy of wild carnivores • Biological characteristics of wild carnivores • Endangered species of wild carnivores • Measures for protection of wild carnivores of the families: *- Felidae* *- Canidae*	

<table>
<tr><td></td><td>- Ursuidae
- Mustelidae</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student's activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>First periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Second periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam.
* Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluation (two): written
First periodical evaluation: Meaning of wild carnivores to the ecosystem, Taxonomy of wild carnivores, characteristics of wild carnivores, Endangered species of wild carnivores
Second periodical evaluation: Measures for protection of wild carnivores
Complete final exam: Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are:
<table>
<tr><th>Grade mark</th><th>Points</th></tr>
<tr><td>5</td><td>to 59</td></tr>
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<tr><td>9</td><td>85-92</td></tr>
<tr><td>10</td><td>93-100</td></tr>
</table>
Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Закон за ловство на Р.Македонија. Службен весник на РМ бр. 26 од 24.02.2009 год.
2. Трпков Б., Дончев И., Дроздовски И.: Ловечки прирачник. Сојуз на ловечки организации на Македонија, Скопје, 1978.
3. Трпков Б.: Ловство. Шумарски факултет Скопје, Скопје, 1989.
4. Hawksworth L.D. and Bull T.A.: Biodiversity and Conservation in Europe. Springer, 2008.
5. Hawksworth L.D. and Bull T.A.: Vertebrate Conservation and Biodiversity. Springer, 2007.
6. Macdonald W.D. and Sillero-Zubiri C.: Biology and Conservation of Wild Canids. Oxford University Press, 2004.
7. Grzimek's Animal Life Encyclopedia – Mammals. Thomson-Gale, 2004.</td></tr>
</table>

<table>
<tr><td>Course</td><td colspan="2">DIVERSITY AND PROTECTION OF BIRDS OF PREY</td><td>2 credit points</td></tr>
<tr><td>Code</td><td colspan="3">FVM 015</td></tr>
<tr><td>Year of study</td><td colspan="3">Third (III)</td></tr>
<tr><td>Semester</td><td colspan="3">Fifth (V)</td></tr>
<tr><td>Total teaching lessons</td><td colspan="3">30</td></tr>
<tr><td>Course type</td><td colspan="3">Elective</td></tr>
<tr><td>Prerequisities</td><td colspan="3"></td></tr>
<tr><td>Author of the course program</td><td colspan="3">prof. Misho Hristovski, PhD</td></tr>
<tr><td>Realized by</td><td colspan="3">prof. Misho Hristovski, PhD</td></tr>
<tr><td>Purpose and objectives of the course program</td><td colspan="3">The aim of the course is to introduce the students with the basic knowledge for protecting birds of pray.
The lectures include the meaning of birds of pray, Taxonomy and biological characteristics of birds of pray and measures for conservation of birds of pray.
During the seminars various programs for protecting birds of pray will be studied.</td></tr>
<tr><td>Content overview</td><td colspan="3">• Meaning of birds of pray to the ecosystem
• Taxonomy of birds of pray
• Biological characteristics of birds of pray
• Measures of protection of:
- hawks
- eagles
- falcons
- vultures
- blizzards
- owls</td></tr>
<tr><td>Organization</td><td colspan="3">Theory classes: 1 lesson a week (15 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td colspan="3">Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td colspan="3">The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student's activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>First periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Second periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>

* With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam.
* Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td colspan="3">Periodical evaluation (two): written
First periodical evaluation: Meaning of birds of pray to the ecosystem, Taxonomy of birds of pray, characteristics of birds of pray, Endangered species of birds of pray.

Second periodical evaluation: Measures for protection of birds of pray.

Complete final exam: Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are:</td></tr>
</table>

Grade mark	Points
5	to 59
6	60-68
7	69-76
8	77-84
9	85-92
10	93-100

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. **Закон за ловство на Р.Македонија**. Службен весник на РМ бр. 26 од 24.02.2009 год. 2. Трпков Б., Дончев И., Дроздовски И.: **Ловечки прирачник.** Сојуз на ловечки организации на Македонија, Скопје, 1978. 3. Трпков Б.: **Ловство**. Шумарски факултет Скопје, Скопје, 1989. 4. Hawksworth L.D. and Bull T.A.: **Biodiversity and Conservation in Europe**. Springer, 2008. 5. Hawksworth L.D. and Bull T.A.: **Vertebrate Conservation and Biodiversity**. Springer, 2007. 6. **Grzimek's Animal Life Encyclopedia – Birds**. Thomson-Gale, 2003.

Course	**DIVERSITY AND PROTECTION OF FISH**	**2 credit points**
Code	**FVM 016**	
Year of study	**Third (III)**	
Semester	**Fifth (V)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	The aim of the course is to introduce the students with the basic knowledge about the diversity of fish and ways of protecting them. The lectures include the meaning of fishing and aquaculture, taxonomy of fish and endangered species of fish, the reasons for decreasing of fish population and the possibility for their repopulation. During the seminars the manners of protecting the endangered specias of fish will be studied in groups.	
Content overview	• Meaning of fishing and aquaculture • Taxonomy of fish • Endangered species of fish • Modification of natural inhabitats • Dams and other hydrological objects • Water quality • Introduced species • Overfishing • Trade • Aquaculture	
Organization	Theory classes: 1 lesson a week (15 lessons) Seminars: 1 lesson a week (15 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.	

Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** **Attendance on theory classes** — minimum **12**, maximum **15** **Attendance on seminars** — minimum **12**, maximum **15** **Written assay** — minimum **6**, maximum **10** **First periodical evaluation** — minimum **15**, maximum **30** **Second periodical evaluation** — minimum **15**, maximum **30** **Total:** minimum **60**, maximum **100** * With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam. * Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.
Evaluation of knowledge и оценување	**Periodical evaluation (two):** written **First periodical evaluation:** Meaning of fishing and aquaculture, Taxonomy of fish, Endangered species of fish, Modification of natural inhabitats, Dams and other hydrological objects. **Second periodical evaluation:** Water quality, Introduced species, Overfishing, Trade, Aquaculture. **Complete final exam:** Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are: **5** — **to 59** **6** — **60-68** **7** — **69-76** **8** — **77-84** **9** — **85-92** **10** — **93-100** **Final grade mark forming criteria:** **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. Helfman S.G.: **Fish Conservation**. Island Press, Washington, USA, 2007. 2. Nelson S.J.: **Fishes of the World**. John Wiley & Sons, Inc., 2006. 3. Hickman P.C., Roberts S.L. Larson A.: **Animal Diversity**. The McGraw-Hill Companies, 2002. 4. Levin A.S.: **Encyclopedia of Biodiversity** Vol. 2. Academic Press, 2001.

Course	**ORNAMENTAL AQUACULTURE**	**2 credit points**
Code	**FVM 017**	
Year of study	**Third (III)**	
Semester	**Fifth (V)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the	prof. Misho Hristovski, PhD	

<table>
<tr><td>course program</td><td></td></tr>
<tr><td>Realized by</td><td>prof. Misho Hristovski, PhD</td></tr>
<tr><td>Purpose and objectives of the course program</td><td>The aim of the course is to introduce the students with the ways of growing ornamental fish
The lectures include the general characteristics of ornamental aquaculture, types of fish, characteristics of the water, health or the fish farmed and marketing of the farmed fish.
During the seminars the ways of farming ornamental fish will be studied in groups.</td></tr>
<tr><td>Content overview</td><td>• Historical development of ornamental aquaculture
• Types of ornamental freshwater fish
• Water quality
• Water quantity
• Management of water
• Reproduction of ornamental fish
• Growth and development of ornamental fish
• Farming
• Health management of the farmed fish
• Marketing</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.
Scoring of the student’s activities:

<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>First periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Second periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>

* With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam.
* Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluation (two): written

First periodical evaluation: Historical development of ornamental aquaculture, Types of ornamental freshwater fish, Water quality, Water quantity, Management of water.

Second periodical evaluation: Reproduction of ornamental fish, Growth and development of ornamental fish, Farming, Health management of the farmed fish. Marketing

Complete final exam: Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam’s grade marks are:
<table>
<tr><th>Grade mark</th><th>Points</th></tr>
<tr><td>5</td><td>to 59</td></tr>
<tr><td>6</td><td>60-68</td></tr>
<tr><td>7</td><td>69-76</td></tr>
<tr><td>8</td><td>77-84</td></tr>
<tr><td>9</td><td>85-92</td></tr>
<tr><td>10</td><td>93-100</td></tr>
</table>

Final grade mark forming criteria:</td></tr>
</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)**
Basic teaching aids	1. Stickney R.R.: **Encyclopedia of aquaculture**. John Wiley & Sons, Inc. New York, USA, 2000.		

Course	**SPORT AND HOBBY FISHING**	**2 credit points**
Code	**FVM 018**	
Year of study	**Third (III)**	
Semester	**Fifth (V)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	The aim of the course is to give students basic for the rules and techniques of the sport fishing. Lectures cover meaning of sport fishing, significant species of fishes,required equipment and accessories, methods of fishing, restocking and protect of fish fund. During seminars, in groups will be processed technics of fishing for different kinds of fish.	
Content overview	• Sport fishing in the world and in our country. • Kinds of fishes significant for sports and recreational fishing. • Fishing tools and equipment. • Food and baits for fishing • Techniques for fishing • Fishing Bon-Ton • Organization of matches • Restocking on open waters • Protection of fish fund • Law for fisheries and aquaculture • National federation of Macedonia in sports fishing	
Organization	Theory classes: 1 lesson a week (15 lessons) Seminars: 1 lesson a week (15 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.	
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**	

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance on seminars	**12**	**15**
Written assay	**6**	**10**
First periodical evaluation	**15**	**30**
Second periodical evaluation	**15**	**30**
Total:	**60**	**100**

* With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam.
* Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.

Evaluation of knowledge u	**Periodical evaluation (two):** written **First periodical evaluation:** Sport fishing in the world and our country, kinds of fishes significant

оценување	for sports and recreational fishing, fishing tools and equipment, food and baits for fishing, techniques for fishing, fishing Bon-Ton **Second periodical evaluation:** Organization of matches , restocking on open waters, protection of fish fund, law for fisheries and aquaculture, national federation of Macedonia in sports fishing **Complete final exam:** Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are: ***Grade mark*** / ***Points*** **5** / **to 59** **6** / **60-68** **7** / **69-76** **8** / **77-84** **9** / **85-92** **10** / **93-100** **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. Христовски М. и Стоименовски З.: **Спортско риболовен Сојуз на Македонија**. Национален форум за заштита на животните на Македонија, Скопје, 1999. 2. Наумовски М.: **Рибите во Македонија**. Жаки-Скопје, Скопје, 1995. 3. Toth, M.: **Fishing Basics.** Penguin publisher, 1997. 4. Young C.D.: **Fly Fishing – The lifetime sport**. Honeybear Press LLC, USA, 2005

Course	**BASIS OF CYTOLOGY DIAGNOSTICS**	**2 credit points**
Code	**FVM 019**	
Year of study	**Third (III)**	
Semester	**Fifth (V)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Igor Ulchar, PhD	
Realized by	prof. Igor Ulchar, PhD ass. Irena Celeska, MSc	
Purpose and objectives of the course program	The aim of the course is better and easier learning of basic principles of clinical cytology, which can be used in routine diagnostic. As a scientific discipline it can be abroad useful in clinical diagnostic.	
Content overview	***Introduction in cytology interpretation*** 1. Principles in cytology evaluation 2. Cytopathological techniques 3. Infective agents 4. Skin and subcutaneously lesion 5. Lymphatic system – lymph nodes, lien and thymus 6. Cerebrospinal fluid 7. Head and neck – oropharingx, tonsils, salivary glands, thyreoid gland, parathyreoid glands 8. Respiratory system – nose, trachea, bronchi and lung 9. Pleural and peritoneal fluid 10. Gastrointestinal system – gut, liver, pancreas 11. Muscle-skeletal system 12. Synovial fluid 13. Urinary system – kidney, urethra and urinary bladder	

<table>
<tr><td></td><td>14. Reproductive system – vagina, uterus, prostate, testis and mammary gland
15. Eye and ear</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Practicals: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table><tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr><tr><th>minimum</th><th>maximum</th></tr><tr><td>Attendance on theory classes</td><td>2</td><td>5</td></tr><tr><td>Attendance and activity (knowledge) on practicals</td><td>2</td><td>5</td></tr><tr><td>Written assay</td><td>0</td><td>10</td></tr><tr><td>Final exam</td><td>0</td><td>80</td></tr><tr><td>Total:</td><td>56</td><td>100</td></tr></table></td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Final exam: oral or written
Final grade mark forming criteria:
<table><tr><th>Points</th><th>Grade mark</th></tr><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></table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Paul Canfield, Patricia Martin, Veterinary Cytology, A postgraduate foundation publication, University of Sydney, 1998</td></tr>
</table>

Course	**VETERINARY HEMATOLOGY**	**2 credit points**
Code	**FVM 020**	
Year of study	**Third (III)**	
Semester	**Fifth (V)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Igor Ulchar, PhD	
Realized by	prof. Igor Ulchar, PhD ass. Irena Celeska, MSc	
Purpose and objectives of the course program	The aim of the subject is learning of physiology and pathology of the hematopeitic system and blood cells, i.e. all details which are not concerned in Pathophisiology.	
Content overview	1. Blood and bone marrow examination 2. Comparative hematology in domestic mammals 3. Comparative hematology in poultry and other mammals 4. Hematopoiesis 5. Coagulation and coagulation disorders 6. Platelets 7. Physiology of red blood cells and their changes in certain disease 8. Anemia and polycythemia 9. Hemolytic anemia 10. Depressive and hypoproliferative anemia 11. Granulocytes (neutrophils, eosinophils and mastocytes) 12. Agranulocytes (monocytes and macrophages, lymphocytes and plasma cells) 13. Interpretation of white blood cells parameters	

<table>
<tr><td></td><td>14. Leukemia in domestic animals
15. Plasma proteins and disproteinemias; Immunohematology</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Practicals: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:

<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>2</td><td>5</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>2</td><td>5</td></tr>
<tr><td>Written assay</td><td>0</td><td>10</td></tr>
<tr><td>Final exam</td><td>0</td><td>80</td></tr>
<tr><td>Total:</td><td>56</td><td>100</td></tr>
</table></td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Final exam: oral or written

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. N.C. Jain, Essentials of Veterinary Hematology, Lea & Febiger, Philadelphia, 1993.
2. A.H. Rebar, P.S. MacWilliams, B.F. Feldman, F.L. Metzger, R.V.H. Pollock, and J. Roche (Eds.), A Guide to Hematology in Dogs and Cats, IVIS, 2005.</td></tr>
</table>

Course	**TROPICAL PARASITIC DISEASES**	**1 credit point**
Code	**FVM 021**	
Year of study	**Fourth (IV)**	
Semester	**Eighth (VIII)**	
Total teaching lessons	**15**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Dino Chrchev, PhD ass. prof. Jovana Stefanovska, PhD	
Realized by	ass. prof. Jovana Stefanovska, PhD	
Purpose and objectives of the course program	The aim of the course is to introduce the students of veterinary medicine with the morphology and biology of parasites from tropical and subtropical areas, with their epizootiology (epidemiology), pathogenesis, clinical manifestation, as well as the methods of diagnostics, treatment and eradication of diseases they cause. Students will be familiarized with the clinical approach to parasite diseases important in public health and with their laboratory diagnostics. This subject will enable students to decide on the principle of overcoming and eradication of parasitological problems in tropical and subtropical areas independently.	
Content overview	• Eastcoast fever and malignant sheep thayleriosis • Tripenosomiasis • (nagana, surra, goufar, murrina, derrengadera, mal de caderas and Chagas disease) - 4 lessons • Fasciolosis, Clonorchiasis, paragonimiasis and schistosmiasis - 3,5 lessons) • Eaozonofilen meningoencefalitis, Gnatostomiasis, and Dracunculosis - 1,5 lessons • Dirofilariasis, Elephantiasis, onhocerciasis, loiasis, stephano filariasis - 2,5 lessons • Pulicosis (Tunga penetrans),myiasas (Dermatobia hominis, Cordylobia anthropophaga, Cochliomyia hominivorax, Lucilia spp., Calliphora spp., Phormia spp., Chrysomyia spp..	

	Auchmeromyia luteola – parasitism - 2 lessons
Organization	Theory classes: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities** ***Activity type*** / ***Points*** (***minimum*** / ***maximum***): **Attendance on theory classes** 12 / 15 **Written assay** 6 / 10 **Periodical evaluations (one)** 42 / 75 **Final exam** not predicted* **Total:** 60 / 100 * Final exam is actually one periodical evaluation.
Evaluation of knowledge и оценување	**Periodical evaluation (one):** written **Final grade mark forming criteria:** ***Points*** / ***Grade mark***: **do 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. G.D. Schmidt & L.S. Roberts: FOUNDATION OF PARASITOLOGY, Times Mirror/Mosby, 3 rd -5 th edition St. Louis - Santa Clara, 1985 - Singapoor, 2000

Course	**RATIONAL APPLICATION OF ANTIMICROBIAL DRUGS**	**1 credit point**
Code	**FVM022**	
Year of study	**Fourth (IV)**	
Semester	**Eighth (VIII)**	
Total teaching lessons	15	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Romel Velev, PhD	
Realized by	prof. Romel Velev, PhD	
Purpose and objectives of the course program	The purpose of this course is to acquaint the student the need for increased awareness in prescribing of antimicrobial drugs, to introduce the problem of antibiotic resistance and the basic principles of proper use of antimicrobial drugs integral as part of good veterinary practice.	
Content overview	- introducing the European platform for responsible use of the drugs in animals - legislative for introducing the antimicrobial drugs in market - obtaining health for the animals - principles of appropriate use of antimicrobial drugs - choice of the appropriate antibiotic - monitoring of the antibiotic use - antibiotic resistance - antibiotic alternative and integrated programs for control of the diseases	
Organization	Seminars: 1 lesson a week (15 lessons)	
Teaching methods	Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.	
	The student is obligated for active participation in all predicted activities for gaining points which	

<table>
<tr><td>Specific recommendations related with teaching</td><td>are part of the final evaluation.

Scoring of the student's activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>24</td><td>30</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (one)</td><td>30</td><td>60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is not predicted, except if student did not pass the periodical evaluation.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluation (one): written
Final exam: not predicted, except if student did not pass the periodical evaluation
Complete exam: not predicted

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. FVE: Antibiotic Resistance & Prudent use of Antibiotics in Veterinary Medicine.
2. EPRUMA: Best Practice Framework for the use of Antimicrobials in Food-Producing Animals in the EU.</td></tr>
</table>

Course	**CYNOLOGY**	**2 credit points**
Code	**FVM 023**	
Year of study	**Fourth (IV)**	
Semester	**Eighth (VIII)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	ass. prof. Goran Nikolovski, PhD	
Realized by	ass. prof. Goran Nikolovski, PhD	
Purpose and objectives of the course program	*Definition of the course:* Trough this module student gains knowledge form Cynology, about history of the cynology organization and their work in the world and in our country; cynology associations, breed classification, breeding dogs, hygiene of the coat, diet, accommodation. *Position of the course in veterinary education:* with this subject, students extend their knowledge about dog's breeds. Detail describing the existence of different groups of dogs by their international classification specificity in groups and specificity of each breed individually. This approach allows students to recognize and differentiate the diseases connected with each breed. *Relations of the course with the curriculum:* The topics that are subject of presentation include the characteristics of the body in different dog breeds. Also, are described the breed's standards in relation to structure of the body, skin, coat, color and other specific signs for the breed. That is why is recommended this subject to be studied together with Internal diseases in pets, or after finishing this course.	
Content overview	**Lectures:** Introduction in cynology, organizations **1 lesson** Division of dog breeds according to FCI-classification **3 lessons** Yugoslav Shepherd Dog origin and characteristics **1 lesson** Breeding dogs (sexual maturation, offspring, mating, pregnancy, delivery, care for the offspring – critical periods, marking the offspring) **2 lessons** Breeding dogs and dog training **1 lesson** Hygiene of the coat and diet specialties **1 lesson** Nutrition of the litter and young dogs **1 lesson** Accommodation of dogs **1 lesson** **Practicals:** Each student will be required to prepare seminar work about one of the FCI groups or about	

<table>
<tr><td></td><td>characteristics of certain dog breed. 10 lessons
Practicals - visiting and participating on cynology exhibitions. 9 lessons</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (total 11 lessons)
Practicals and seminars: 1 lesson a week (10 lessons), cynologic exhibitions (9 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (making discussions about breeding, description of some breeds, using video materials)
Practicals: every student prepares a assay about animal category or about certain breed; oral presentation by the students.
Active participation and presentation of student’s participation on a cynologic exhibition.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>8</td><td>11</td></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>6</td><td>10</td></tr>
<tr><td>Practicals</td><td>5</td><td>9</td></tr>
<tr><td>Final exam</td><td colspan="2">predicted</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is predicted. Criterion for passing the final exam is gaining of 50% of points predicted with theory classes, seminars and practicals.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>*Final exam: student is required to pass the final exam oraly or written. Criterion for passing the final exam is gaining of 50% of points predicted with theory classes, seminars and practicals.

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Prof. dr. sc. Mario Bauer. Кинологија, Школска книга Загреб, 1996
2. The Kennel Club’s Illustrated Breed Standards The official guide to registered breeds Ebury Press, London 2003</td></tr>
</table>

Course	**MARKETING OF VETERINARY PRACTICE**	**1 credit point**
Code	**FVM 024**	
Year of study	**Fifth (V)**	
Semester	**Ninth (IX)**	
Total teaching lessons	**1+0**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Blagica Sekovska, PhD	
Realized by	prof. Blagica Sekovska, PhD	
Purpose and objectives of the course program	***Theory classes*** have aim to introduce the students with basis of marketing in veterinary practice. That means that students have to get basic knowledge for their future becoming part of the economy with establishment of private veterinary practice. This course is closely related and compatible with the compulsory course Basis of management and management of veterinary practice. Both these courses would obtain to the students to attract as possible as it get more clients, as well as to keep them. The future doctor of veterinary medicine has to get basic knowledge about expectations of his/her clients, how to improve his/her practice and to make as possible as it get higher profit. For this goal some basic knowledge is necessary about clients behavior, nature and features of offered service, modes how prices could and have to be made, channels for distribution of information to the client, i.e. how marketing instruments to be successfully used for practice managing.	

THEORY CLASSES

No of lessons	*Teaching unit*	*Contents of teaching unit*
1 -2	Introduction	Definition, range and subject of study of marketing, meaning of marketing for success in veterinary practice, basic terms in marketing.
3-4	Marketing environment in veterinary practice	Impact of economical, technical, social and other external factors on success in veterinary practice.
5-6	Knowing the clients of veterinary practice	What is the behavior of the clients, which are their motives and needs. How to win and keep the clients.
7-8	Marketing instruments in most successful ranking on the market	Introducing with every particular marketing instrument and its putting in function. Service. Price. Promotion. Distribution.
9-10	Veterinary service market	Features and specificities of service market
11-12	Meaning and development of marketing strategies	What are marketing strategies, types of strategies, their meaning for increased success in work.
13	Types of marketing strategies suitable for veterinary practice	Price strategies, promotional strategies, strategies for distribution, qualitative strategies.
14	How to research service market	Main rules and examples of small market researching.
15	Organization and control of marketing activities	How to make successful organization of marketing activities in veterinary practice. How to evaluate their affectivity.

<table>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>8</td><td>12</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>12</td><td>14</td></tr>
<tr><td>Written assay</td><td>10</td><td>14</td></tr>
<tr><td>Periodical evaluations (one)</td><td>/</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">-</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table></td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (one): written

*Final exam: oral or written (includes one periodical evaluation)

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Доц. д-р Благица Сековска: Маркетинг менаџмент на анимални производи, 2008, Скопје
2. Филип Котлер: Маркетинг на услуги
3. Shawn P. Messonier: Marketing Your Veterinary Practice, Misury, 2000</td></tr>
</table>

Course	**CONTEMPORARY FOOD SAFETY SYSTEMS**	**2 credit points**
Code	**FVM 025**	
Студиска програма	**Fifth (V)**	
Semester	**Ninth (IX)**	

<table>
<tr><td>Total teaching lessons</td><td>30</td></tr>
<tr><td>Course type</td><td>Elective</td></tr>
<tr><td>Prerequisities</td><td></td></tr>
<tr><td>Author of the course program</td><td>prof. Pavle Sekulovski, PhD</td></tr>
<tr><td>Realized by</td><td>prof. Pavle Sekulovski, PhD
ass. prof. Dean Jankuloski, PhD
ass. Sloboden Chokrevski, MSc</td></tr>
<tr><td>Purpose and objectives of the course program</td><td>Aim of this course is that students get advanced knowledge about Contemporary systems for food safety. During the course they will learn with all new food safety systems and pre-requisites also like GMP, GHP, GAP, HACCP, TQM, LISA. The implementation of those systems in different fields of food industry will be presented with practical examples. They will have the opportunity to elaborate different HACCP plans by themselves.</td></tr>
<tr><td>Content overview</td><td>• Contemporary systems for food safety
• Good manufacturing practice
• Good hygienic practice
• Good agriculture practice
• History of HACCP system
• Aims of HACCP system
• Seven HACCP principles
• Generic HACCP plans
• HACCP implementation on farms
• HACCP implementation in slaughterhouses
• HACCP implementation in meat processing
• HACCP implementation in milk processing
• HACCP implementation in fish processing
• Connection between HACCP and TQM
• HACCP and TQM for retail and catering
• HACCP and consumers
• Predictive microbiology and HACCP
• Risk analyses, HACCP and microbiological criteria in food industry</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>Minimum</th><th>Maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is not predicted, except if student did not pass one of the periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two): written
First periodical evaluation:
Second periodical evaluation:

*Final exam: oral or written (includes one periodical evaluation)

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<tr><td>To 59</td><td>5 (F)</td></tr>
</table></td></tr>
</table>

60-68	6 (E)
69-76	7 (D)
77-84	8 (C)
85-92	9 (B)
93-100	10 (A)

Basic teaching aids	1. Corlett, D. A. (1998) HACCP Users Manual 2. Данев, М., Секуловски, П. (2003) Водич за HACCP систем 3. Forsythe, S. J., Hayes, P.R. (1998) Food Hygiene, Microbiology and HACCP 4. Morrtimore, S., Wallace, C. (1998) HACCP A practical Approach 5. Pearson, A.M., Dutson, T.R. (1999) HACCP in Meat, Poultry and Fish Processing: Advances in Meat Research Series Vol.10

Course	**MANAGEMENT OF ANIMAL PRODUCTS SUPPLY CHAINS**	**2 credit points**
Code	**FVM 026**	
Year of study	**Fifth (V)**	
Semester	**Ninth (IX)**	
Total teaching lessons	**2+0**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Blagica Sekovska, PhD	
Realized by	prof. Blagica Sekovska, PhD	
Purpose and objectives of the course program	Supply chains are actual topic in EU. One of the basic tasks of veterinary profession is to observe animal products through these chains starting with production itself, and up to final consummation of the product. Because of that, it is necessary to know all rules and economic aspects of these chains. The aim of this course is to introduce in detail the future veterinarian with supply chains, their importance, meaning, economic aspects, organization rules and regulation. This course is especially recommended for students who would work in domain of veterinary inspection and veterinary administration.	
Content overview	• Definition of animal products supply chains • Types of animal products supply chains • Measures for improvement of animal products supply chains • Distribution of animal products • Types of distribution • Transport and logistics • Planning of animal products supply chains • Making decisions about animal products supply chains (financial decisions, security decisions, strategic decisions etc.) • Organization of animal products supply chains • Control of animal products supply chains	
Organization	Theory classes: 2 lessons a week (30 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.	
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**	

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on seminars	**12**	**15**
Written assay	**6**	**10**
Periodical evaluations (two)	**15(x2)=30**	**30(x2)=60**
Final exam	**not predicted***	
Total:	**60**	**100**

* Final exam is not predicted, except if student did not pass one of the periodical evaluations.

Evaluation of knowledge u	**Periodical evaluation (two):** written First periodical evaluation: Општо за каналите за набавка на анимални производи

<table>
<tr><td>оценување</td><td>Second periodical evaluation: стратешки одлуки за каналите за набавка на анимални производи
*Final exam: oral or written (includes one periodical evaluation)

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Y. Narahari and S. Biswas: Supply Chain Management: Modeling and Decision Making, Indian Institute of Science, Bangalore
2. Благица Сековска Маркетинг менаџмент на анимални производи, Скопје 2008</td></tr>
</table>

Course	**MICROBIOLOGY OF FOOD**	**2 credit points**
Code	**FVM 027**	
Студиска програма	**Fifth (V)**	
Semester	**Ninth (IX)**	
Total teaching lessons	**15+15**	
Course type	Elective	
Prerequisities		
Автор на програми	prof. Pavle Sekulovski, PhD	
Realized by	prof. Pavle Sekulovski, PhD ass. prof. Dean Jankuloski, PhD	
Purpose and objectives of the course program	The aim 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. Students will be acquainted in details with the types of microorganisms and their characteristics and the hazards they pose to the human health. 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.	
Content overview	• Development and evolution of the food microbiology • General principles of the growth and development of the microorganisms • Dynamic factors in the growth of the microorganisms • Dynamics of the microorganisms extinction • Interaction between the factors affecting the survival of the microorganisms • Microorganisms that spoil the food • Food poisoning • Pathogenic bacteria in the food • Mycotoxigenic moulds • Viruses • Parasites in the food and in the water • Indicator microorganisms • Fermentation of the food • Control of microbiological quality and the food safety • Microbiological Criteria • Routine methods in the food microbiology • Quick methods and automation • Advanced methods in the food microbiology	
Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 1 lesson a week (15 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) Practicals: laboratory practicals in microbiology of food; Active participation of the students in laboratory work on microorganism isolation and identification.	

	Written assay: learning with use of referent literature and internet, preparing seminar work
Специфични препораки за настава	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** **Activity type** / **Points (minimum / maximum)** **Attendance on theory classes** 12 / 15 **Attendance on Practicals** 12 / 15 **Written assay** 6 / 10 **Periodical evaluations (two)** 15(x2)=30 / 30(x2)=60 **Final exam** not predicted* **Total:** 60 / 100 * Final exam is not predicted, except if student did not pass one of the periodical evaluations.
Evaluation of knowledge	**Periodical evaluation (two):** written First periodical evaluation: basis of microbiology of food Second periodical evaluation: advanced microbiology of food ***Final exam:** oral or written (includes one periodical evaluation) **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.** Eley, A. R. (1996) Microbial Food Poisoning 2. Garbutt, J. (1997) Essentials of Food Microbiology 3. Doyle, M.P., Beuchat, L.R., Montville, T.J.(2007) Food Microbiology: Fundamentals and Frontiers

Course	**TECHNOLOGIC PROCESSES ON A POULTRY FARM**	**2 credit points**
Code	**FVM 028**	
Year of study	**Fifth (V)**	
Semester	**Ninth (IX)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Metodija Dodovski, PhD ass. Aleksandar Dodovski, MSc	
Realized by	prof. Metodija Dodovski, PhD ass. Aleksandar Dodovski, MSc	
Purpose and objectives of the course program	Aim of the course is to give the students theoretical basis for the practical way of running a poultry farm and to familiarize with technological processes in all phases of production of different economic categories. Lectures include demonstration of basic technological processes starting from parent stock, hatchery, day old chicks to commercial farms for rearing and exploitation of broilers and table egg layers. During the course clinical problems from everyday farm life will be solved in team work. The student will have oral presentation of the teaching unit by his/her choice.	
Content overview	Technology of production of parent stocks, Technology in incubation station. Technology of breeding chicks and replacement pullets, Technology of production of table egg layers, Technology of production of broilers Documentation on poultry farm	
Organization	Theory classes: 1 lesson a week (15 lessons) Seminars: 1 lesson a week (15 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature;	

<table>
<tr><td></td><td>active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student's activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>

* Final exam is not predicted, except if student did not pass one of the periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluation (two): written
First periodical evaluation: Technology of production of parent stocks, technology in incubation station
Second periodical evaluation: т technology of breeding chicks and replacement pullets, technology of production of table egg layers, technology of production of broilers, documentation on poultry farm

*Final exam: oral or written

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Breeding manuals from different hybrid producers
2. Живинарство - проф. д-р Бориша Супиќ, проф. д-р Нико Милошевиќ, проф. д-р Тимотеј Чобиќ, Универзитет во Нови Сад, 2000</td></tr>
</table>

Course	**AQUACULTURE**	**2 credit points**
Code	**FVM 029**	
Year of study	**Fifth (V)**	
Semester	**Ninth (IX)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	***Theory classes*** of this course have aim to introduce the students with meaning of aquaculture in our country and in the world, basis of ecology of the aquatic ecosystems, main terms in aquaculture, breeding of commercially most important species of wormwater and coldwater fish, health protection of fish in aquacultural production and breeding of crustaceans and frogs. With this course the future doctor of veterinary medicine would get knowledge about breeding of most important species of wormwater and coldwater fish species, basic principles of health protection of fish and breeding techniques for crustaceans and frogs, as well as ability for giving advices for promotion of optimal aquacultural production and health of breeded animals. ***Practicals*** in the course Aquaculture have aim to introduce the students with all fish species breeded in Republic of Macedonia, basics of anatomy and physiology of fish, choice of location of pond, quality and quantity of water for aquaculture, dimensioning of the pond, planning of fish production, nutrition of fish and transport of fish and reproductive material.	

THEORY CLASSES

No of lessons	*Teaching unit*	*Contents of teaching unit*
1	DEFINITION AND MEANING OF AQUACULTURE	Historic development of aquaculture, production of fish, aquaculture in Republic of Macedonia.
2	BASIS OF AQUATIC ECOSYSTEMS ECOLOGY	Water as bioenvironment, types of aquatic ecosystems, ecological factors of aquatic environment, distribution and content of bioenvironment in water, ecosystem metabolism, aquatic environment pollution and water quality
3	BASIC TERMS IN AQUACULTURE	Breeding fish species, types of aquaculture, types of aquacultural breeding
4 - 8	BREEDING OF WARMWATER FISH SPECIES	Breeding of common carp, grass carp (white amur), silver carp, tench, goldfish, wels catfish, eel, sturgeon, zander, tilapia
9 - 12	BREEDING OF COLDWATER FISH SPECIES	Breeding of rainbow trout, brown trout, brook trout, Ohrid trout
13	HEALTH CARE OF FISH IN AQUACULTURAL PRODUCTION	Most common diseases in breeded fish in R. of Macedonia, fish diseases control measures
14	BREEDING OF CRUSTACEANS	Breeding of Eurepean crayfish
15	BREEDING OF FROGS	*Rana rudibunda, Rana esculenta, Rana dalmatina, Rana lessonae, Rana temporaria, Rana graeca*

PRACTICALS

No of lessons	*Teaching unit and contents of teaching unit*
1	Fish species breeded in Republic of Macedonia
2	Basis of anatomy and physiology of fish
3	Choice for location of pond
4	Water quality for aquaculture
5	Water quantity for aquaculture
6	Dimensioning of pond
7	Planning of fish production
8	Nutrition of fish
9	Transport of fish and reproductive material
10-11	Visit of ground pond for breeding of carp
12-13	Visit of cage pond for breeding of carp/trout
14-15	Visit of trout pond

Organization	Theory classes: 1 lesson a week (15 lessons) Seminars: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.

Specific recommendations related with teaching

The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student's activities:

Activity type	*Points*	
	minimum	*maximum*
Attendance on theory classes	**12**	**15**
Attendance on practicals	**12**	**15**
Written assay	**6**	**10**
First periodical evaluation	**15**	**30**
Second periodical evaluation	**15**	**30**
Total:	**60**	**100**

* With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam.
* Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.

Evaluation of knowledge

Periodical evaluation (two): written

First periodical evaluation: Definition and meaning of aquaculture, basis of aquatic ecosystems ecology, basic terms in aquaculture, breeding of warmwater fish species, fish species breeded in Republic of Macedonia, basis of anatomy and physiology of fish, choice for location of pond, water quality and quantity for aquaculture
Second periodical evaluation: Breeding of coldwater fish species, health care of fish in aquacultural production, breeding of crustaceans, breeding of frogs, dimensioning of pond, planning of fish production, nutrition of fish, transport of fish and reproductive material.
Complete final exam: Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are:

Grade mark	*Points*
5	**to 59**
6	**60-68**
7	**69-76**
8	**77-84**
9	**85-92**
10	**93-100**

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. Христовски М., Стојановски С.: **Биологија, одгледување и болести на рибите**. Национален форум за заштита на животните на Македонија, Скопје, 2005.
2. Христовски М., Кожухаров С.: **Маркетинг менаџмент во аквакултурата**. Национален форум за заштита на животните на Македонија ,Скопје, 2004.
3. Марковиќ З. и Митровиќ-Тутунџиќ В.: **Гајење риба.** Задужбина Андрејевиќ Београд, Београд, 2003.
4. Богут И., Хорватх Л., Адамек З и Катавиќ И.: **Рибогојство**. Полјопривредни факултет у Осијеку, Осијек, 2006.
5. Pillay T.V.R.: **Aquaculture: Principles and Practices**. Fishing News Books, Osney Mead, Oxford OX2 0EL, England, 1993.
6. Stickney R.R.: **Encyclopedia of aquaculture**. John Wiley & Sons, Inc. New York, USA, 2000.

<table>
<tr><td>Course</td><td>CLINICAL PHARMACOLOGY</td><td>3 credit points</td></tr>
<tr><td>Code</td><td colspan="2">FVM 030</td></tr>
<tr><td>Year of study</td><td colspan="2">Fifth (V)</td></tr>
<tr><td>Semester</td><td colspan="2">Ninth (IX)</td></tr>
<tr><td>Total teaching lessons</td><td colspan="2">45</td></tr>
<tr><td>Course type</td><td colspan="2">Elective</td></tr>
<tr><td>Prerequisities</td><td colspan="2"></td></tr>
<tr><td>Author of the course program</td><td colspan="2">prof. Romel Velev, PhD</td></tr>
<tr><td>Realized by</td><td colspan="2">prof. Romel Velev, PhD</td></tr>
<tr><td>Purpose and objectives of the course program</td><td colspan="2">The aim of the course is to give students a theoretical basis for practical clinical pharmacology. Lectures include review of the fundamentals of pharmacokinetics, drug metabolism, mechanism of action of the drug receptor, interaction among drugs, and presentation of selected drugs commonly used in veterinary clinical practice. In this way students will be allowed to obtain performance of different groups of veterinary drugs. During the course will be resolved clinical problems exposed in the form of examples from everyday veterinary practice. Also the student will have an oral presentation to the chapter he or she chooses.</td></tr>
<tr><td>Content overview</td><td colspan="2">Lectures from the basic pharmacology
The pharmacokinetic and dosing of drugs
The pharmacokinetic basis of species variations in drug disposition
The concept of bioavailability and application to veterinary dosage forms
Interpretation of changes in drug disposition and interspecies scaling
Some aspects of dosage, clinical selectivity and stereoisomerism
Drug permeation through the skin and topical preparations
Antimicrobial disposition, selection, administration and dosage
The bioavailability and disposition of antimicrobial agents in neonatal animals
Legal requirements for clinical examination of new veterinary drugs
Drug residues and the determining of the withdrawal period for drugs
Lectures based on cases from clinical practice
Drugs acting on the digestive system and metabolism
Fluid and electrolyte therapy
Drugs acting on the heart and circulation
Antibiotics and chemotherapeutics
Anti-inflammatory drugs
Hypnotics, sedatives and anesthetics
Antihelminthics and ectoparasiticides
Hormones affecting reproduction
Dermatological drugs
Ophthalmic drugs
Analgesics</td></tr>
<tr><td>Organization</td><td colspan="2">Theory classes: 2 lessons a week (30 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td colspan="2">Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td colspan="2">The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.
Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is not predicted, except if student did not pass one of the periodical evaluations.</td></tr>
<tr><td>Evaluation of</td><td colspan="2">Periodical evaluation (two): written</td></tr>
</table>

knowledge u оценување	First periodical evaluation: basic pharmacology Second periodical evaluation: cases from the clinical practice ***Final exam:** oral or written (includes one periodical evaluation) **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. Baggot, D. J.: ***The Physiological Basis of Veterinary Clinical Pharmacology.*** Blackwell Science Ltd, 2001. 2. Plavšić F., Stavljenić A., Vrhovac B.: ***Osnove kliničke farmakokinetike.*** Školska knjiga, Zagreb 1992.

Course	**FOOD CHEMISTRY**	**3 credit points**
Code	**FVM 031**	
Year of study	**Fifth (V)**	
Semester	**Ninth (IX)**	
Total teaching lessons	**45 (30 + 15)**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Zehra Hajrulai-Musliu, PhD	
Realized by	prof. Zehra Hajrulai-Musliu, PhD	
Purpose and objectives of the course program	**Theory classes:** Purpose of the matter, as one of the biggest parts of Food Science, aims to familiarize students with the role and significance the composition and properties of nutritional components, chemical changes that affect during storage and preparation process; introduction to nutritional value, quality and safety of foods are so understanding that the quality and safety of food depends on the chemical and physical processes. **Brief program.** Introduction to the chemistry of food. Carbohydrates: the most important oligosaccharides and polysaccharides in foods. Proteins characteristic representatives, nutritional value, preparation of hydrolysis, Maillard-this reaction. Lipids: Saturated and unsaturated fatty acids, essential fatty acids, presence in food oxidation of fatty acids, cholesterol. Vitamins: structure, presence in food, role, features, stability. Other nutritional and biotechnological substrates: terpenoids, steroids, carotenoids, lignans, anthocyanins, glycosides, alkaloids. Functional components of foods: flavonoids, polyphenols and other natural antioxidants. Creation and protection from free radicals. Ions in foods: representation, transport, physiological effects, importance in technological processes. Water: structure, properties, interactions in food. Food additives: sweeteners, preservatives, colour, flavour, antioxidants, emulsifiers. Enzymes in the transformation of the components of food: proteases, lipase, glycosidase, polyphenols - oxidises. Chemistry of basic groceries. **Practicals:** Determination of nutrients, food, definition and study. Basic ingredients of the food, biochemical processes, macronutrients (energy, construction), micronutrients (protective). Determination of residues and contaminants (pesticides, heavy metals). Quality and safety of drinking water and its importance to health.	

THEORY CLASSES

No of lessons	*Teaching unit*	*Contents of teaching unit*
1.	Introduction in Food Chemistry	Importance of the food chemistry in educating veterinarians. Rules for food safety. Legal regulations for quality and food safety.
2.	Energy value of food	Energy needs of different groups. Definition and classification of nutrients depending on their role in the body. Energy value of nutrients. Determination of energy value of nutrients in food products and ready-made food. Principles of rational food: total energy needs of the individual, specific needs and behaviour

		of nutrients in food.
3.	Nutritients	**Carbohydrates.** Monosaccharide's: pentose and hexose, amines and deoxy sugars. Oligosaccharides: maltose, lactose, sucrose, celobyose, raphynose. Polysaccharides: starch, cellulose, hemicelluloses, dextrin's, insulin. Nitrogen polysaccharides. Structure and properties. Assimilated and non assimilated Carbohydrates. Change the carbohydrates in certain products during their processing. Needs of the body from carbohydrates depending on age and intensity of physical work. Utilisation of carbohydrates and their importance to health. Significance of fibber in the body. Glycemic and insulin index of foods.
4.	Nutritients	**Lipids.** General properties of saturated and unsaturated fatty acids. Essential fatty acids. Glycerines': composition, physical and chemical properties, isomers, polymorphism. Cerids. Zoosterol and phytosterols. Phospholipids. Structure and properties of fats in food. Composition and properties of fatty substances in food. Energy value of fat depending on the chain and the various isomer forms of fatty acids. Needs of the body of fat depending on age and intensity of physical work. Rancidity of fats and oils: Biological and Chemical rancidity
5.	Nutritients	**Proteins.** General properties: solubility, amphoterism, sedimentation, coagulation and denaturation of proteins. Classification of proteins according to nutritional value. Physiological role of proteins. Need for protein according to age and condition of the body. Occurrence of intolerance of protein in the diet.
6.	Micro and macro elements in food products	Classification and function. Macro elements. Microelements. Daily needs.
7.	Vitamins	Classification. Liposolubility. Hydrosolubility vitamins. Presence in food products. Changes in the processing of food products. Ratio between the ratio of vitamins and vitamins with other nutrients. Toxicity
8.	Chemical contamination on food	Polycyclic aromatic carbohydrates. Polychlorinated biphenyls. Residues of pesticides and toxic elements (Cd, As, Pb, Zn, Cu, Cr, Hg, Sn, etc.) in food. Permitted quantities in food products and drinking water. Nitrate-nitrite-nitozamins. Residual amounts of antibiotics and hormones in food.
9.	Additives in food products	Health risks of using additives. Antioxidants and synergists. Means of preservation. Colours for colouring of food products. Spices. Artificial sweetening. Artificial and natural flavours. Emulsifiers. Means of swelling.
10.	Dietary foods	Dietary products intended for feeding children, diabetics, the elderly and people with weight problems. Composition and evaluation of nutritional value. Health safety of dietary products.
11.	Biotechnology of food	Functional foods. Organic food. Genetically modified organisms (GMO) in food production
12.	Water for drinking	Composition and quality. Hygienic control and safety of drinking water
13.	Interaction of food ingredients and drugs	Interaction of food ingredients and drugs
14.	Object of general use	Health security and safety

PRACTICALS

No of lessons	***Teaching unit and contents of teaching unit***
1.	Determination of total protein in food products by Kjeldahl
2.	Identification and determination of amino acids with amino-analyser
3.	Determination of fat in food products by Sochlet
4.	Identificaon and determination of fatty acids by gas chromatography
5.	Determination of mono and oligosaccharides with Felling test
6.	Polari metric determination of sucrose
7.	Determination of vitamin C
8.	determination of organochlorine pesticides
9.	Preparation of food samples for determination of residues of metals and metalloids by the method of "dry burning"
10.	Additives. Proof of artificial colors
11.	Proof of preservatives (nitrates, nitrites, sulphites, boric acid, formaldehyde, sorbic acid and benzoate).

12.	Proof of antioxidants, artificial sweeteners
13.	Drinking water. Determination of pHs Determination of residual chlorine. Determination of chloride. Determination of reduction power of water. Determination of nitrogen compounds in water - ammonia, nitrite, and nitrate. Determination of alkalinity and hardness of water. Consumption of potassium permanganate.
14.	Analysis of the composition of dietary products aimed at assessing the energy and biological value. Items for general use

<table>
<tr><td>Organization</td><td>Theory classes: 2 lessons a week (30 lessons)
Practicals: 2 lessons a week (30 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Besides attendance on theory classes and practicals additional condition for course teacher’s signature at the end of the semester, is passing of periodical evaluations during the semester with up to 25% points gained per evaluation.
* Final exam is not predicted. Student who did not pass one of the periodical evaluations during the semester goes to one of the periodical evaluation during the exam sessions.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two): written
First periodical evaluation: - general part
Second periodical evaluation: - special part
Final exam: not predicted
Complete final exam: not predicted
Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Храна, С. Тојагиќ, М. Мирилов, 1998;
2. Анализа животних намирница, Ј. Трајковиќ, М. Мириќ, Ј. Барас, С. Шилер 1983;
3. Foood Analysis Theory and practice Third edition Yeshajahu Pomeranz Clifton E. Meloan New York –London 1994
4. Applications in Medicinal Nutrition Therapy, Frances J. Zeman, Denise M. Ney, 1996.</td></tr>
</table>

<table>
<tr><td>Course</td><td colspan="2">RECONSTRUCTIVE SURGERY OF THE INTENGUMENTARY SYSTEM</td><td>1 credit point</td></tr>
<tr><td>Code</td><td colspan="3">FVM 032</td></tr>
<tr><td>Year of study</td><td colspan="3">Fifth (V)</td></tr>
<tr><td>Semester</td><td colspan="3">Tenth (X)</td></tr>
<tr><td>Total teaching lessons</td><td colspan="3">15</td></tr>
<tr><td>Course type</td><td colspan="3">Elective</td></tr>
<tr><td>Prerequisities</td><td colspan="3"></td></tr>
<tr><td>Author of the course program</td><td colspan="3">prof. Plamen Trojachanec, PhD</td></tr>
<tr><td>Realized by</td><td colspan="3">prof. Plamen Trojachanec, PhD
ass. Ksenija Ilievska, MSc</td></tr>
<tr><td>Purpose and objectives of the course program</td><td colspan="3">The aim of the course is to give the students a fundamental theory for implementation of specific surgical treatments of skin disease in daily practice.
The aim of the course is to enable the students to expand their previous knowledge of anatomy and general surgery. Students will have the opportunity to carry out individual examination and practical work on selected clinical problems.</td></tr>
<tr><td>Content overview</td><td colspan="3">1. Principles of plastic and reconstructive surgery
2. Surgical management of specific skin diseases
3. Surgery of distal limb (digits and footpad)</td></tr>
<tr><td>Organization</td><td colspan="3">Seminars and practical work: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td colspan="3">Independently performing of surgical procedures under the qualified supervision and preparing the written assay by using referent literature and internet in order to encourage the student for independent work and research.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td colspan="3">The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>8</td><td>15</td></tr>
<tr><td>Written assay</td><td>52</td><td>85</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table></td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td colspan="3">Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td colspan="3">1. Slatter Douglas, Textbook of small animal surgery 2nd edition, 2002 Sounders;
2. Fossum Theresa W., Small animal surgery 2nd ed., 2002 Mosby;
3. Harari J. Small animal surgery 1996 Williams & Wilkins;
4. Binnington A.G., Decision making ina small animal soft tissue surgery 1988,
5. Newton., Swaim S. F. Henderson R. A. Small animal wound management 1997 Williams & Wilkins;</td></tr>
</table>

Course	**SELECTED SURGICAL PROCEDURES IN OPHTHALMOLOGY**	**1 credit point**
Code	**FVM 033**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**15**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Plamen Trojachanec, PhD	
Realized by	prof. Plamen Trojachanec, PhD ass. Ksenija Ilievska, MSc	

<table>
<tr><td>Purpose and objectives of the course program</td><td>The aim of the course is to give theoretical basis for practical application of specific surgical procedures in ophthalmology.
The aim of the course is to enable the students to expand their previously acquired knowledge of anatomy, pathology and physiology, general surgery and the fundamentals of veterinary ophthalmology in order to provide correct diagnosis and treatment of ophthalmic diseases. Students will have the opportunity for carrying out individual examination and practical work on selected clinical problems.</td></tr>
<tr><td>Content overview</td><td>1. Specific surgical techniques of the eyelids
2. Specific surgical techniques of third eyelid
3. Surgical treatment for cataract
4. Specific surgical techniques of the eye globe</td></tr>
<tr><td>Organization</td><td>Seminars and practical work: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Independently performing of surgical procedures under the qualified supervision and preparing the written assay by using referent literature and internet in order to encourage the student for independent work and research.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>8</td><td>15</td></tr>
<tr><td>Written assay</td><td>52</td><td>85</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table></td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<tr><td>to 59</td><td>5 (F)</td></tr>
<tr><td>60-68</td><td>6 (E)</td></tr>
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<tr><td>85-92</td><td>9 (B)</td></tr>
<tr><td>93-100</td><td>10 (A)</td></tr>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Матичиќ З., Цапак Д. Oftalmologija domacih zivotinja, 1999, Ветеринарски факултет Загреб
2. Коичев К., Хубенов Х. Ветеринарско медицинска офталмологија, 1998, НИС, Тракиски универзитет
3. Simon M., Petersen-Jones., Sheila M. Crispin. Manual of small animal ophtalmology, 1997, BSAVA
4. Kirk N. Gelatt, Essentials of veterinary ophtalmology, 2005, Blackwell Publishing
5. Douglas Slatter., Fundamentals of Veterinary ophhtalmology, 2001, third edition, W.B. Saunders</td></tr>
</table>

Course	**SELECTED TECHNIQUES FOR SURGICAL FRACTURE REDUCTION**	**1 credit point**
Code	**FVM 034**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**15**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Plamen Trojachanec, PhD	
Realized by	prof. Plamen Trojachanec, PhD ass. Ksenija Ilievska, MSc	
Purpose and objectives of the course program	The aim of the course is to enable the students to expand and apply their previously acquired knowledge of anatomy, general surgery and orthopedics. Students will have the opportunity to gain appropriate knowledge necessary for proper diagnosis and treatment of injuries at the locomotion system and practical work in selected clinical problems.	
Content overview	Techniques of surgical fracture reduction of certain bones	
Organization	Seminars and practical work: 1 lesson a week (15 lessons)	

<table>
<tr><td>Teaching methods</td><td>Independently performing of surgical procedures under the qualified supervision and preparing the written assay by using referent literature and internet in order to encourage the student for independent work and research.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>8</td><td>15</td></tr>
<tr><td>Written assay</td><td>52</td><td>85</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table></td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Slatter Douglas, Textbook of small animal surgery 2nd edtition, 2002 Sounders;
2. Fossum Theresa W., Small animal surgery 2nd ed., 2002 Mosby;,
3. Perimatei D., Flo G., DeCamp C. Small animal orthopedics and fracture repair 2006 Saunders;
4. Harari J. Small animal surgery 1996 Williams & Wilkins;
5. Bojrab Joseph M, Current techmiques in small animal surgery 2 nd edition, 1983 Lea&Febiger,
6. Newton C. D. Nunamaker D. M. Textbook of small animal orthopedics http://cal.nbc.upenn.edu/saortho/index/html</td></tr>
</table>

Course	**ADVANCED REPRODUCTIVE ENDOCRINOLOGY**	**2 credit points**
Code	**FVM035**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Toni Dovenski, PhD	
Realized by	prof. Toni Dovenski, PhD ass. Branko Atanasov, MSc	
Purpose and objectives of the course program	The aim of the course is to obtain fundamenals for possibilities of practical application of reproductive endocrinology. The PhD students would upgrade their previous knowledge from the course Reproduction. They would be able for individual work in realization of individual treatments for estrus synchronization and ovulation, partus synchronization, induction of lactation, superovulation treatments etc.	
Content overview	1. Estrus and ovulation synchronization methods 2. Partus synchronization methods 3. Superovulation provocation methods	
Organization	Seminars and practical work: 2 lessons a week (30 lessons)	
Teaching methods	Independently performing treatments under expert supervision and preparation of seminar paper using professional literature and internet, in order to encouraging the student for independent work and research	
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.	

Scoring of the student's activities:

Activity type	*Points*	
	minimum	*maximum*
Attendance and activity (knowledge) on seminars	**8**	**15**
Written assay	**52**	**85**
Final exam	**not predicted***	
Total:	**60**	**100**

Evaluation of knowledge u оценување

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. Поповски К., К'нчев Љ.: Ендокринологија на репродукцијата.
2. Ветеринарен Институт-Ветеринарен факултет, 1998, Скопје
3. Laboratory Production of Cattle Embryos: I. Gordon, Published by CABI Publishing, 2003; ISBN 0851996663, 9780851996660 ;
4. Lj. Kočoski, T. Dovenski, P. Trojačanec, K. Popovski, G. Mickovski V. Petkov, S. Veselinović, V. Ivkov, N. Ivančev, R. Ičkov, Lj. Mickov: Uvodjenje novih biotehničkih metoda u reprodukciji domaćih životinja - embriotransfer, in-vitro oplodnja i MOET program, II Savetovanje iz kliničke patologije i terapije životinja "Clinica veterinaria" Zbornik radova, 5-11, Budva, S.R. Jugoslavija, 2000.
5. Popovski K., Mickovski G., Dovenski T., Kočoski Lj., Trojačanec P., Petkov V., Mickov Lj: Biotehnologija razmnožavanja ovaca i koza,., II II Savetovanje iz kliničke patologije i terapije životinja "Clinica veterinaria" Zbornik radova, 12-20, Budva, S.R. Jugoslavija, 2000.
6. Интернет страници по препорака

Course	**CLINICAL NUTRITION OF DOGS AND CATS**	**2 credit points**
Code	**FVM 036**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**15+15**	
Course type	Elective	
Prerequisities		
Author of the course program	ass. prof. Goran Nikolovski, PhD	
Realized by	ass. prof. Goran Nikolovski, PhD	
Purpose and objectives of the course program	*Definition of the course:* In the last few years basic principles of clinical nutrition of dogs and cats has been developed. With current information about clinical nutrition of the pets, are created needs for learning of different nutritional needs and the mental framework of the needs related to the metabolism and specific nutritional elements. Disciplines and scientific researches that are applied on the basic methods of nutrition in dogs and cats began to apply recently, and are used from clinical aspect of the nutrition. *Position of the course in veterinary education:* given the advanced information about the relationship of clinical nutrition and metabolic needs of the sick dogs and cats, the need of studying this subject is obvious after overcoming some subjects connected to the diseases of these animals. Certainly the topics that are taught will help students to understand basic principles of nutrition regarding the pathological conditions that are present in the affected animal, the method of application and duration of the special type of diet. *Relations of the course with the curriculum:* topics of study in this subject complement the knowledge obtained by studying clinical subjects. Therefore, it is necessary this subject to be studied after overcoming internal diseases, parasitology and infectious diseases. Also, it's recommended that this course should be heard after solving courses related with surgery. The materials of this course are divided into two parts: the first part concerns the elucidation of the basic principles of clinical nutrition - to be overcome in the lectures; the second part refers to the practical part of clinical nutrition - to be overcome during the practicals that will be required for the students themselves, through enhanced activity	

<table>
<tr><td>Content overview</td><td>Lectures: during the lectures, basic principles of clinical nutrition are going to be explained:
Imbalanced nutrition: importance of the balanced nutrition 2 lessons
Nutrition of hospitalized dogs and cats 2 lessons
Nutrition at intensive care 2 lessons
Techniques for intestinal nutrition support 2 lessons
Nutrition in oncology diseases 1 lesson
Dealing with the foods 2 lessons
Overweight 2 lessons
Allergies' nutrition 2 lessons
Practicals: in this part students will actively participate in preparing themes related to preparation of clinical nutrition, in regard to:
Nutrition of dogs and cats with digestive disorders 4 lessons
Nutrition in liver diseases 1 lesson
Nutrition of dogs and cats with renal failures 4 lessons
Nutrition of dogs and cats with lower urinary tract disorders 2 lessons
Nutrition at cardiovascular disorders 2 lessons
Nutrition in skin disorders 2 lessons</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (total 15 lessons)
Practicals: 1 lesson a week (total 15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students, using video materials)
Practicals: within practicals students are active participants in preparing of topics related with the practical application of clinical nutrition, active participation and preparation of recommendation for nutrition in certain clinical cases.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student's activities:<table><tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr><tr><th>minimum</th><th>maximum</th></tr><tr><td>Attendance on theory classes</td><td>10</td><td>15</td></tr><tr><td>Attendance and activity (knowledge) on seminars</td><td>6</td><td>10</td></tr><tr><td>Practicals</td><td>10</td><td>15</td></tr><tr><td>Final exam</td><td colspan="2">predicted</td></tr><tr><td>Total:</td><td>60</td><td>100</td></tr></table>* Final exam is predicted. Criterion for passing the final exam is gaining of 50% of points predicted with theory classes, seminars and practicals.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>*Final exam: student is required to pass the final exam orally or written.

Final grade mark forming criteria:<table><tr><th>Points</th><th>Grade mark</th></tr><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></table></td></tr>
<tr><td>Basic teaching aids</td><td>1. The Waltham book of Clinical nutrition of the dog and cat by Josephine M. Wills & Kenneth W. Simpson, Butler&Turner ltd 1994
2. Applied clinical nutrition of the dog an cat Third edition P.J. Markwell &K Hurley 2001</td></tr>
</table>

Course	**TROPICAL INFECTIOUS DISEASES**	**2 credit points**
Code	**FVM 037**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**15+15**	
Course type	Elective	
Prerequisities		
Author of the	prof. Ivancho Naletoski, PhD	

course program	prof. Slavcho Mrenoshki, PhD
Realized by	prof. Slavcho Mrenoshki, PhD
Purpose and objectives of the course program	The aim of the course is to introduce the students with specific features of the tropical diseases, their prevalence, as well as meaning and modes of regional and global control of these diseases.

Редни Број	***Teaching unit***	***Lessons***
1	African horse sickness	1
2	African swine fever	1
3	Lumpy skin disease	1
4	Bluetongue	1
5	Rinderpest	1
6	Rift Valley fever	1
7	Peste des petits ruminants	1
8	Nairobi sheep disease	1
9	Dermatophilosis	1
10	Q fever	1
11	Bovine contagious ceratoconjunctivitis	1
12	Anaplasmosis	1
13	Heartwater	1
14	Epizootic lymphangitis	1
15	Contagious bovine pleuropneumonia	1

<table>
<tr><td>Organization</td><td>Theory classes - 1 lesson a week
Practicals - 1 lesson a week</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>23</td><td>30</td></tr>
<tr><td>Written assay</td><td>0</td><td>5</td></tr>
<tr><td>Periodical evaluations (two)</td><td>10</td><td>20</td></tr>
<tr><td>Final exam</td><td>15</td><td>30</td></tr>
<tr><td>Complete final exam*</td><td colspan="2"><table><tr><th>Grade mark</th><th>Points</th></tr><tr><td>Six (6)</td><td>20</td></tr><tr><td>Seven (7)</td><td>25</td></tr><tr><td>Eight (8)</td><td>30</td></tr><tr><td>Nine (9)</td><td>35</td></tr><tr><td>Ten (10)</td><td>43</td></tr></table></td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>

Prerequisite criteria: For being able to pass the final exam student has to gain up to 40 points from theory classes and practicals and the two periodical evaluations. If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two): written
Final exam: written-oral
Complete final exam: oral + written

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<tr><td>to 59</td><td>5 (F)</td></tr>
<tr><td>60-69</td><td>6 (E)</td></tr>
</table></td></tr>
</table>

		70-77	**7 (D)**
		78-86	**8 (C)**
		87-93	**9 (B)**
		94-100	**10 (A)**
Basic teaching aids	1. Berislav Jukic: Tropske zarazne bolesti zivotinja. Veterinarski fakultet Sveucilista u Zagrebu, 2003. 2. W.A. Geering, A.J. Forman and M.J. Nunn: Exotic diseases of animals. Australian Government Publishing Service Beograd, Canberra, 1995.		

Course	**BREEDING AND DISEASES OF OSTRICHES**	**2 credit points**
Code	**FVM 038**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Metodija Dodovski, PhD ass. Aleksandar Dodovski, MSc	
Realized by	prof. Metodija Dodovski, PhD ass. Aleksandar Dodovski, MSc	
Purpose and objectives of the course program	Aim of the course is to give the students theoretical basis for the production and diseases which affect ostriches. Lectures include demonstration of basic basics of anatomy and physiology of ostriches, production systems, prevention of diseases, specific immunoprophylaxis, and diseases of different etiology and their therapy. During the course clinical problems from everyday practice will be solved in team work. The student will have oral presentation of the teaching unit by his/her choice.	
Content overview	Basics of anatomy and physiology of ostriches Ostrich breeding Production of breeding stock Hatching eggs procedures Production of juveniles Biosecurity measures Bacterial diseases Viral diseases Fungal diseases Parasitic diseases Avitaminoses Metabolic disorders Poisonings	
	Theory classes: 1 lesson a week (15 lessons) Seminars: 1 lesson a week (15 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.	
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**	

Activity type	***Points***	
	minimum	***maximum***
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on seminars	**12**	**15**
Written assay	**6**	**10**
Periodical evaluations (two)	**15(x2)=30**	**30(x2)=60**
Final exam	**not predicted***	
Total:	**60**	**100**

* Final exam is not predicted, except if student did not pass one of the periodical evaluations.

Evaluation of	**Periodical evaluation (two):** written

knowledge u оценување	First periodical evaluation: Basics of anatomy and physiology of ostriches, Ostrich breeding, biosecurity measures Second periodical evaluation: Bacterial diseases, Viral diseases, fungal diseases, parasitic diseases, avitaminoses, metabolic disorders, poisonings ***Final exam:** oral or 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. Ostrich Diseases - F. W. Huchzermeyer, Onderstepoort Veterinary Institute, 1994

Course	**BREEDING AND DISEASES OF PIGEONS**	**2 credit points**
Code	**FVM 039**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Metodija Dodovski, PhD ass. Aleksandar Dodovski, MSc	
Realized by	prof. Metodija Dodovski, PhD ass. Aleksandar Dodovski, MSc	
Purpose and objectives of the course program	Aim of the course is to give the students theoretical basis for the production and diseases which affect pigeons. Lectures include demonstration of basic basics of anatomy and physiology of pigeons, proper rearing of pigeons, prevention of diseases in to the holding, specific immunoprophylaxis and diseases of different etiology and their therapy. During the course clinical problems from everyday practice will be solved in team work. The student will have oral presentation of the teaching unit by his/her choice.	
Content overview	Basics of anatomy and physiology of pigeons Rearing of pigeons Biosecurity measures Bacterial diseases Viral diseases Fungal diseases Parasitic diseases Avitaminoses Metabolic disorders Poisonings	
Organization	Theory classes: 1 lesson a week (15 lessons) Seminars: 1 lesson a week (15 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.	
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**	

Activity type	*Points*	
	minimum	*maximum*
Attendance on theory classes	**12**	**15**
Attendance and activity (knowledge) on seminars	**12**	**15**
Written assay	**6**	**10**

	Periodical evaluations (two) | **15(x2)=30** | **30(x2)=60** **Final exam** | **not predicted*** **Total:** | **60** | **100** * Final exam is not predicted, except if student did not pass one of the periodical evaluations.
Evaluation of knowledge и оценување	**Periodical evaluation (two):** written First periodical evaluation: Basics of anatomy and physiology of pigeons, rearing of pigeons, biosecurity measures, bacterial diseases, viral diseases Second periodical evaluation: Fungal diseases, parasitic diseases, avitaminoses, metabolic disorders, poisonings ***Final exam:** oral or 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. Bolesti golubova - Marko Seferovic 2. Болести голубова - Димитрије Палић 3. Actual extracts from internet

Course	**ORGANIC APICULTURE**	**2 credit points**
Code	**FVM 040**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	The aim of the course is to give students basics for organic production of bee products. Lectures cover the meaning of apiculture and basic terms of organic production of food, basic principles of organic beekeeping and necessary procedures which should be perform with focus on production of organic certificate bee products. During seminars in groups will be processed apitechnic procedures for organic production of bee products.	
Content overview	• Meaning of apiculture • Term of organic production of food • Basic principles of organic beekeeping • Period of conversion • Origin of bees • Location of bee garden • Bee habitat • Wax and honeycomb • Nutrition of bees • Breeding practice • Purchase of queen bees, nucleuses and bee families • Health management of bees • Extraction and storage of honey • Quality control of organic • Labeling	
Organization	Theory classes: 1 lesson a week (15 lessons) Seminars: 1 lesson a week (15 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral	

	presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** * With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam. * Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.
Evaluation of knowledge и оценување	**Periodical evaluation (two):** written **First periodical evaluation:** Meaning of apiculture, definition for organic production of food, basic principlesfor organic beekeeping, period of conversion, origin of bees, location of beegarden, Bee habitat, wax and honeycomb. **Second periodical evaluation:** Nutrition of bees, breeding practice, purchase of queen bees, nucleuses and bee families, health management of bees, extraction and storage of honey, quality control of organic honey, labeling. **Complete final exam:** Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are: **Final grade mark forming criteria:**
Basic teaching aids	1. Naturland Standards for Organic Beekeeping, 2008. 2. Demeter standards for beekeeping and hive products, 2008.

Activity type	*Points*	
	minimum	*maximum*
Attendance on theory classes	**12**	**15**
Attendance on seminars	**12**	**15**
Written assay	**6**	**10**
First periodical evaluation	**15**	**30**
Second periodical evaluation	**15**	**30**
Total:	**60**	**100**

Grade mark	*Points*
5	**to 59**
6	**60-68**
7	**69-76**
8	**77-84**
9	**85-92**
10	**93-100**

Points	*Grade mark*
to 59	**5 (Ф)**
60-68	**6 (Е)**
69-76	**7 (Д)**
77-84	**8 (Ц)**
85-92	**9 (Б)**
93-100	**10 (А)**

Course	**ECOLOGIC CONTROL OF BEE DISEASES**	**2 credit points**
Code	**FVM 041**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	

<table>
<tr><td>Realized by</td><td>prof. Misho Hristovski, PhD</td></tr>
<tr><td>Purpose and objectives of the course program</td><td>The aim of the course is to introduce students with ecological means on control of diseases, pests and enemies of bees.
Lectures cover meaning of apipathology, most common diseases in bees and bee brood and ecological means of control of diseases, pests and enemies of bees towards production of health safety bee products.
During seminars, practically will be processed ecological means on control of diseases, pests and enemies of bees.</td></tr>
<tr><td>Content overview</td><td>• Meaning of apipathology
• Most common diseases in adult bees
• Most common diseases in bee brood
• Ecological control of viral diseases in bees.
• Ecological control of bacterial diseases in bees.
• Ecological control of fungal diseases in bees.
• Ecological control of parasitic diseases in bees.
• Ecological control of noninfection diseases in bees.
• Ecological control of pests in bees.
• Ecological control of enemies in bees.</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>First periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Second periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>

* With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam.
* Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained 60 points.</td></tr>
</table>

Evaluation of knowledge и оценување	**Periodical evaluation (two):** written **First periodical evaluation:** Meaning of apipathology, most common diseases in adult bees, most common diseases in bee brood, ecological control of viral and bacterial diseases in bees **Second periodical evaluation:** Ecological control of fungal, parasitic and non infection diseases in bees. ecological control of pests and enemies in bees. **Complete final exam:** Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam's grade marks are: ***Grade mark*** / ***Points*** **5** / **to 59** **6** / **60-68** **7** / **69-76** **8** / **77-84** **9** / **85-92** **10** / **93-100** **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	6. Христовски М. и Цветковиќ А.: **Современа контрола на вароозата**. Факултет за ветеринарна медицина во Скопје, Скопје, 2009. 7. Христовски М.: **Пчеларството во 21 век.** Национален форум за заштита на животните на Македонија, Скопје, 2004. 8. Morse A. R. and Flottum K.: **Honey bee pests, predators & diseases**. 3rd ed. A.I. Root Company, Medina, Ohio, USA, 1997. 9. Добриќ Ѓ., Вицковиќ Д., Кулишиќ З.: **Болести пчела**. Факултет ветеринарске медицине Универзитета у Београду, Београд, 2000.

Course	**MANAGEMENT OF WILDLIFE DISEASES**	**2 credit points**
Code	**FVM 042**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Misho Hristovski, PhD	
Realized by	prof. Misho Hristovski, PhD	
Purpose and objectives of the course program	The aim of the course is to give to students basics for the manners of management and control of the diseases in wildlife. Lectures cover general features of diseases in wildlife, research of target population and ecological factors, creation of database and management manners with diseases in wildlife. During seminars in groups will be work out different programs for management of diseases in wildlife.	
Content overview	• General features of diseases in wildlife • Problems during work with animals in free nature • Identification and defining of disease • Collecting data for population • Define of ecological factors • Collecting and shipment material • Researching occurrence for new, chronic and inapparent diseases	

<table>
<tr><td></td><td>

Database
Basics principles of management of diseases in wildlife
Management of causer or its vector
Management by manipulation with population of host
Management with medical treatment and immunisation
Management by modification of environment
Management by anthropogenic activities
Programs for urgent and integrated management of diseases
Assessment of efficiency of program for management of diseases

</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>First periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Second periodical evaluation</td><td>15</td><td>30</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>

* With gaining up to 60 points from attendance on theory classes and practicals, written assay and two periodical evaluations, student gets right to take grade mark without passing the complete final exam.
* Complete final exam is required for the student who did not pass one of the two periodical evaluations during the semester, or if he/she did not gained minimal 60 points.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluation (two): written

First periodical evaluation: General features of diseases in wildlife, problems during work with animals in free nature, identification and defining of disease, collecting data for population, define of ecological factors, collecting and shipment material, researching occurrence for new, chronic and inapparent diseases, database

Second periodical evaluation: Basic principles of management of diseases in wildlife, management of causer or its vector, management by manipulation with population of host, management with medical treatment and immunization, Management by modification of environment, management by anthropogenic activities, programs for urgent and integrated management of diseases, assessment of efficiency of program for management of diseases

Complete final exam: Oral or written and it contents practical test and final exam. Practical test is graded descriptively (passed/not passed), and the final exam with grade mark from 5 to 10. Point equivalents to the final exam’s grade marks are:
<table>
<tr><th>Grade mark</th><th>Points</th></tr>
<tr><td>5</td><td>to 59</td></tr>
<tr><td>6</td><td>60-68</td></tr>
<tr><td>7</td><td>69-76</td></tr>
<tr><td>8</td><td>77-84</td></tr>
<tr><td>9</td><td>85-92</td></tr>
<tr><td>10</td><td>93-100</td></tr>
</table>
</td></tr>
</table>

	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. Wobeser A.G.: **Diseases in Wild Animals: Investigation and Management.** Springer, 2007. 2. Delahay R.J., Smith G.C., Hutchings M.R.: **Management of Disease in Wild Mammals.** Springer, 2009.

Course	**PARASITOLOGY IN PUBLIC HEALTH**	**2 credit points**
Code	**FVM 043**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Dino Chrchev, PhD ass. prof. Jovana Stefanovska, PhD	
Realized by	ass. prof. Jovana Stefanovska, PhD	
Purpose and objectives of the course program	Through this course students will learn about the clinical approach and laboratory diagnosis of parasitic diseases which are significant zoononsis and are of great importance in public health.	
Content overview	Introduction: Definition of zoonosis. The role of the parasitic zoonoses in world health. Epidemiology and prevalence of the parasitic zoonoses. **PROTOZOA** • Giardiosis, balantidosis, eutamoebosis • Toxoplasmosis • Cryptosporidiosis and pneumocystosis • Random protozoan infestations in humans **TREMATODA** • Fasciolosis and dicrocoeliosis **CESTODA** • Teniasis and cysticercosis • Hydatidosis and cenurosis • Diphylobotriosis, hymenolepodosis and random cestodal infestations in humans **NEMATODA** • Trichinelosis • Visceral and cutaneous larva migrans syndrome • Strongyloidosis-1 • Anisakidosis and random nematodal infestations in humans **ARTHROPODA** • Infestations with ticks in habitats and grazing fields, lice and trombiculid mites • Random infestations of humans with other ectoparasites from animals and allergic reactions in humans • Miasis	
Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 1 lesson a week (15 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Practicals: Performing of diagnostic methods in laboratory. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.	
Specific	The student is obligated for active participation in all predicted activities for gaining points which	

recommendations related with teaching	are part of the final evaluation. **Scoring of the student's activities:** **Activity type** / **Points** (minimum / maximum) **Attendance on theory classes** 12 / 15 **Attendance on practicals** 12 / 15 **Written assay** 6 / 10 **Periodical evaluations (two)** (2x15) 30 / (2x30) 60 **Final exam** not predicted* **Total:** 60 / 100 * Final exam are actually the two periodical evaluations.
Evaluation of knowledge u оценување	**Periodical evaluation (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. G.D. Schmidt, L.S. Roberts: FOUNDATION OF PARASITOLOGY, Times Mirror/Mosby, 3th edition, St. Louis - Toronto - Santa Clara 1985.

Course	**HARMFUL ANTINUTRITIVE SUBSTANCES IN FEED**	**2 credit points**
Code	**FVM 044**	
Year of study	**Fifth (V)**	
Semester	**Tenth (IX)**	
Total teaching lessons	**30 (15+15)**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Risto Prodanov, PhD	
Realized by	prof. Risto Prodanov, PhD ass. Radmila Chrcheva-Nikolovska, MSc	
Purpose and objectives of the course program	The goal of this course is, students to acquire and deepen the theoretical and practical knowledge of antinutritive harmful substances present in the feed - substances naturally present in the feed (natural metabolites), or substances that has reached in the feed trough contamination. The lectures include a display of certain groups of foods witch besides nutrients are carriers of various harmful substances, as well as factors that have impact on the amount of their prudential share. Through the program students will learn about different types of foods that are carriers of harmful substances - antinutritive ingredients that can cause health and immunosuppressive problems in animals, and through their products, in for of residues can be a threat to the human health. During the lectures it will be learned which antinutritive substances are found in which feed. Ways of prevention, demonstrated as examples in the everyday veterinary practice. Also the student will have an oral presentation of a teaching unit of his/her own choice.	
Content overview	• Definition and types of harmful substances • Factors that influence the occurrence of harmful substances • Factors that contribute to the negative effect of harmful substances • Harmful substances related to certain types of animal feed • Harmful substances that occur in tooth feed • Harmful substances in feed introduced trough contamination • Harmful substances of biological nature • Molds and mycotoxins in feed	

<table>
<tr><td></td><td>

Bacteria and their metabolites in feed
Heavy metals, radionuclides and toxic elements in feed
Prevention and reduction of the harmful effects of the antinutritive substances

</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (15 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.
Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is not predicted, except if student did not pass one of the periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluation (two): written
First periodical evaluation: types of antinutritive substances and feed in which they are present
Second periodical evaluation: factors affecting harmful substances, and prevention of this factors
*Final exam: oral or written (includes one periodical evaluation)

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>

Forenbacher S.: Otrovne Biljke i Biljna otrovanja zivotinja, Zagreb-1998;
Sinovec Z., Resanovic R., Sinovec Snezana: Mikotoksini-Pojava, efekti i prevencija, Beograd-2006.,
Проданов Р.: Исхрана на домашните животни-општ дел (скрипта-материјал за интерна употреба);
Каливода М.: Крмива, Загреб -1990;
Радовановиќ Т. и сор.: Исхрана домаќих животиња, Чачак -1997;
Јовановиќ Р.: Исхрана домаќих животиња, Нови Сад - 2001;
Џукиќ Д.: Биљке за производњу сточне хране, Нови Сад - 2002.

</td></tr>
</table>

Course	**ADDITIVES IN FEED - HEALTH MODULATORS**	**2 credit points**
Code	**FVM 045**	
Year of study	**Fifth (V)**	
Semester	**Tenth (IX)**	
Total teaching lessons	**30 (15+15)**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Risto Prodanov, PhD	
Realized by	prof. Risto Prodanov, PhD ass. Radmila Chrcheva-Nikolovska, MSc	
Purpose and objectives of the course program	The course Additives in feed - health modulators aims to introduce the students and the future experts in veterinary medicine with the additives and their use in feed, I order to raise and improve the production in the domestic animals.	

	Every day there is a new product on the market commercially available with different contents and use. This elective course will significantly help veterinarians in practice, as well as the future veterinary nutritionists, in managing trough the endless offer of various essential an non–essential additives, dietary supplements, supplements for feed and food. The ultimate goal of the course Additives in feed - health modulators, is to influence the increase of the quality and quantity of safe food intended for human consumption (meat, milk, eggs).
Content overview	• Introduction • Chemical composition of feed (essences of different substances) • Definition and type of additives • Importance and classification of additives in feed • Vitamins and their important in feed • Synthetic amino acids • Microelements (chelatinised) • Probiotics • Prebiotics • Symbiotic • Enzymes • Antioxidants • Emulators • Pigments – dyes • Aromatic substances • Organic acids • Tannins • Antibiotics (their application in the past and today)
Organization	Theory classes: 1 lesson a week (15 lessons) Seminars: 1 lesson a week (15 lessons)
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.
Specific recommendations related with teaching	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:** ***Activity type*** / ***Points*** (***minimum*** / ***maximum***) **Attendance on theory classes**: **12** / **15** **Attendance and activity (knowledge) on seminars**: **12** / **15** **Written assay**: **6** / **10** **Periodical evaluations (two)**: **15(x2)=30** / **30(x2)=60** **Final exam**: **not predicted*** **Total:** **60** / **100** * Final exam is not predicted, except if student did not pass one of the periodical evaluations.
Evaluation of knowledge и оценување	**Periodical evaluation (two):** written **First periodical evaluation**: importance and application of different additives **Second periodical evaluation**: types and mechanism of action of additives ***Final exam:** oral or written (includes one periodical evaluation) **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. Проданов Р., Исхрана на домашните животни-општ дел (скрипта-материјал за интерна употреба); 2. Каливода М., Крмива, Загреб -1990; 3. Синовец З., Стимулатори раста у исхрани непреживара, Београд-2000; 4. Pond, W. G., Church D. C., Pond K. R. (1995): Basic Animal Nutrition and Feeding

(Fourth Edition). John Wiley and Sons Inc.;
5. Adams, C. A. (1999): Nutricines. Food components in health and nutrition. Nottingham University Press, Nottingham;
6. Adams, C. A. (2002): Total Nutrition. Feeding animals for health and growth. Nottingham University Press, Nottingham.

Course	**RESIDUES AND CONTAMINENTS IN FOOD**	**2 credit points**
Code	**FVM046**	
Студиска програма	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Автор на програми	prof. Pavle Sekulovski, PhD	
Realized by	prof. Pavle Sekulovski, PhD prof. Romel Velev, PhD prof. Zehra Hajrulai-Musliu, PhD Elizabeta Stojkovik-Dimitrievska, PhD Biljana Dimzoska-Stojanovska, MSc	
Purpose and objectives of the course program	The aim of the course is to acquaint students with profound knowledge about the monitoring of residues and contaminants in food for people. They will meet with European and domestic legal framework related to the presence of these substances in food and control their use and penal provisions in case of exceeding the statutory provisions. In the practical part students will participation and take active participation in laboratory analysis proving the specific residues and contaminants in food.	
Content overview	• Legal framework for the control of residues and contaminants in food of animal origin • Division of residues and contaminants according to European legislation • Stilbens • Thyreostatics • Steroids • Lactones of rezorcil acid • Beta agonists • Other substances - Group A6 • Antimicrobial substances • Veterinary drugs (antihelminthics, coccidiostats, carbamates and piretroides, sedatives, NSAID, other pharmacologically active substances) • Organochlorine pesticides and PCB • Organophosphorus pesticides • Toxic elements • Mycotoxins • Pigments • MRL, ADI • Specific control measures • Monitoring and control plans for residues • Methods for detection and quantification • Laboratory network, interlaboratory testing, accreditation	
Organization	Theory classes: 1 lesson a week (15 lessons) Practicals: 1 lesson a week (15 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) Practicals: Laboratory practicals for determination of some residues and contaminents in food. Written assay: learning with use of referent literature and internet, preparing seminar work.	
Специфичнои препораки за настава	The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation. **Scoring of the student's activities:**	

Activity type	***Points***	
	Minimum	***Maximum***
Attendance on theory classes	**12**	**15**
Attendance on practicals	**12**	**15**

Written assay	**6**	**10**
Periodical evaluations (two)	**15(x2)=30**	**30(x2)=60**
Final exam	**not predicted***	
Total:	**60**	**100**

* Final exam is not predicted, except if student did not pass one of the periodical evaluations.

Evaluation of knowledge	**Periodical evaluations (two):** written First periodical evaluation: Second periodical evaluation: ***Final exam:** oral or written (includes one periodical evaluation) **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. http://ec.europa.eu/food/index_en.htm 2. http://www.efsa.europa.eu/

Course	**TOXICOLOGY OF POISONOUS PLANTS**	**2 credit points**
Code	**FVM047**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Romel Velev, PhD	
Realized by	prof. Romel Velev, PhD	
Purpose and objectives of the course program	The aim of this course is to acquaint the student with systematic and morphological characteristics of plants whose effects in the animal organism is harmful or toxic, their prevalence in nature, active components that contain and which lead to intoxication, effects and symptoms that they manifest among individual animals, with pathomorphological changes and practical significance of poisoning with these plants. With the course will be processed poisoning in domestic animals caused by certain algae, fungi, ferns, and gymnosperms and angiosperms which the student is given the opportunity to visualize the different types of poisonous plants. Different types of poisonous plants and plant toxins will be exhibited in the form of examples of everyday veterinary practice.	
Content overview	**General part** - Factors affecting the toxicity of the plant - Signs of intoxication with poisonous plants - Diagnosis of intoxication with poisonous plants - Practical significance of plant poisoning - Prevention of intoxication with poisonous plants - Treatment of animals intoxicated with poisonous plants **Special part** - Poisoning of animals caused by certain species of algae - Poisoning of animals caused by certain species of fungi - Poisoning of animals caused by certain species of ferns - Poisoning of animals caused by certain species of gymnosperms - Poisoning of animals caused by certain species of angiosperms (monocots and dicots)	
Organization	Theory classes and seminars: 2 lessons a week (30 lessons)	
Teaching methods	Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students. Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student's choice. Written assay: learning with use of referent literature and internet, preparing seminar work.	

<table>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student's activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is not predicted, except if student did not pass one of the periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluations (two): written
First periodical evaluation: - general part
Second periodical evaluation: - special part
Final exam: not predicted
Complete final exam: not predicted
Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<tr><td>do 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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Forenbacher S.: Otrovne biljke i biljna otrovanja životinja. Školska knjiga d.d., Zagreb, 1998.
2. Дилов П. и др.: Ветеринарномедицинска токсикология. Лесотехнически Университет - София, Факултет по ветеринарна медицина, София, 2005.
3. Srebočan V., Gomerčić: Veterinarski priručnik (Otrovanja: Otrovno bilje). 4 izdanje, JUMENA, Zagreb, 1989.</td></tr>
</table>

Course	**ONCOLOGY**	**3 credit points**
Code	**FVM 048**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**45**	
Course type	**Elective**	
Prerequisities		
Author of the course program	ass. prof. Trpe Ristoski, PhD	
Realized by	ass. prof. Trpe Ristoski, PhD	
Purpose and objectives of the course program	Having regard of rapidly increasing importance of the tumors in routine veterinary practice, as well as many complications caused by their appearing, it is necessary to introduce the students with pathogenesis, diagnostics and treatment of the tumours. Besides theory classes, during the teaching the student would have opportunity to be related with the tumor pathology from the practical aspect. With application of the most recent classification of tumors, this course includes tumors of all organic systems, with special attention on skin tumors and tumors of mammary gland in bitches. Also, tumors in domestic animal are very important part of the veterinary pathology from the aspect of the comparative oncology because their big similarity with human tumors.	
Content overview	• Tumour nomenclature • Features of the benign and malignant tumours • Cancerogenesis: molecular basis of tumours • Tumour ethiology • Classification of tumors o mesenchyme tissue tumours o epithelial tissue tumours • Clinical features of the tumours • Laboratory diagnostics of the tumours	

<table>
<tr><td></td><td>• Treatment of the tumours</td></tr>
<tr><td>Organization</td><td>Theory classes: 2 lessons a week (30 lessons)
Practicals: 1 lessons a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Practicals: practicals (clinical cases, morphological features of the tumors; laboratory diagnostics of tumors; diagnosis and treatment of tumors).
Written assay: learning with use of referent literature and internet, preparing seminar work; presentation and discussion about the seminar work</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on practicals</td><td>24</td><td>30</td></tr>
<tr><td>Written assay</td><td>5</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>10</td><td>20</td></tr>
<tr><td>Final exam</td><td>9</td><td>25</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>

Prerequisite criteria: For being able to pass the final exam student has to gain up to 45 points from theory classes and practicals and the two periodical evaluations. If student does not show result on the one of the periodical evaluation, but has gained points only on theory classes and practicals, he/she has to go on complete final exam.</td></tr>
<tr><td>Evaluation of knowledge</td><td>Periodical evaluation (two): written
First periodical evaluation: Tumour nomenclature, Features of the benign and malign tumours, Cancerogenesis: molecular basis of tumours, Tumour etiology
Second periodical evaluation: Classification of tumours, Clinical features of the tumours, Laboratory diagnostics of the tumours, Threatment of the tumours

Final exam: oral

Complete final exam: oral + practical

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Мицевски Ц. и Ристоски Т.: Патолошко хистолошки практикум. Вет.факултет, Скопје-2003.
2. Kumar, Cotran, Robbins: Basic Pathology. 7 edition, 2003.
3. Jubb K., Kenedy P., Plamer N.: Pathology of domestic animals. 4-1992.
4. Милијана Кнежевиќ- Милијан Јовановиќ: Општа патологија. Макарије, 1999.</td></tr>
</table>

Course	**TECHNIQUES OF ANAESTHESIA AND ANALGESIA IN DIFFERENT PET ANIMALS**	**1 credit point**
Code	**FVM049**	
Year of study	Fifth (V)	
Semester	Tenth (X)	
Total teaching lessons	15	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Plamen Trojachanec, PhD	
Realized by	prof. Plamen Trojachanec, PhD ass. Ksenija Ilievska, MSc	

<table>
<tr><td>Purpose and objectives of the course program</td><td>The aim of the course is to enable the students to expand and apply their previously acquired knowledge of anatomy, pathology, pharmacology, general surgery and anesthesiology. Students will have the opportunity to perform individual examination, anesthetic application and running anesthetic protocols for pets and exotic animals and practical work in selected clinical problems.</td></tr>
<tr><td>Content overview</td><td>1. Specific anesthetic techniques and immobilization in pet animals
1. Specific anesthetic techniques and immobilization in exotic pets</td></tr>
<tr><td>Organization</td><td>Seminars and practical work: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Independently performing of surgical procedures under the qualified supervision and preparing the written assay by using referent literature and internet in order to encourage the student for independent work and research.</td></tr>
<tr><td>Purpose and objectives of the course program</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>8</td><td>15</td></tr>
<tr><td>Written assay</td><td>52</td><td>85</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table></td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Тројачанец П., Основи на Ветеринарна анестезиологија, 2009, Факултет за Ветеринарна медицина Скопје;
2. Thurmon J.C., Tranquilli W.J., Benson G.J.Lumb & Jones Veterinary Anesthesia 3rd edition. 1996, Williams &Wilkins</td></tr>
</table>

Course	**VETERINARY INSPECTION**	**3 credit points**
Code	**FVM050**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**45 (2 + 1)**	
Course type	Elective	
Prerequisities		
Authors of the course program	prof. Risto Prodanov, PhD prof. Pavle Sekulovski, PhD ass. Sloboden Chokrevski, MSc	
Realized by	prof. Risto Prodanov, PhD prof. Pavle Sekulovski, PhD ass. Sloboden Chokrevski, MSc	
Purpose and objectives of the course program	Through this course students are introduced to modern principles, structure and functioning of the veterinary-sanitary control and inspection in accordance with the legislation of the Macedonian national veterinary public health, food safety and EU legislation. The goal is to complete different chapters of the Law on Veterinary Health, Food Safety Law, Law on the consumer protection and accompanying bylaws related to competencies of veterinary inspection and to introduce students in their practical application.	
Content overview	**THEORY CLASSES:** • Organization of veterinary inspection (state bodies responsible for veterinary inspection), structure and organization of the Food and Veterinary Agency. • Organization and legal responsibilities in veterinary-sanitary supervision, control and audit of veterinary inspection in the EU (DG SANCO, Food and Veterinary Office FVO). • Implementation of veterinary inspection in the production and marketing of products of animal origin and regulations pertaining to food safety under the the Law on Veterinary Health	

<table>
<tr><td></td><td>and Food Safety Law.
• Analysis, management and communication of risks in veterinary inspection.
• Practical application of the powers, duties and responsibilities of the authorized and official veterinarian performing the inspection work:
▪ contents of the inspection,
▪ sampling for specific laboratory tests,
▪ preparation of documentation paperwork (inquiries, accompanying letters, findings and solutions).
• Certification and regulations for identification and declaration of animal food products (labels, quality and origin).
• Work of the state veterinary border inspection, review of documents, identification and physical examination of consignments of animals and products of animal origin.
• Law on Consumer Protection, role of the Food and Veterinary Agency.

PRACTICALS: Practical introduction to the work of veterinary inspection in the primary production and placing on the market of the products of animal origin (slaughterhouse practices, dairy processing facilities, the warehouses and the retail).</td></tr>
<tr><td>Organization</td><td>Theory classes: 2 lessons a week (30 lessons)
Seminars: 1 lesson a week (15 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students) and presentations by the students.
Seminars: discussion on topics mentioned on the lectures or written in the referent literature; active participation of the student (exposing personal opinions, ideas, discussion); oral presentation of a teaching using by the student’s choice.
Written assay: learning with use of referent literature and internet, preparing seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>12</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>12</td><td>15</td></tr>
<tr><td>Written assay</td><td>6</td><td>10</td></tr>
<tr><td>Periodical evaluations (two)</td><td>15(x2)=30</td><td>30(x2)=60</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>
* Final exam is not predicted, except if student did not pass one of the periodical evaluations.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Periodical evaluation (two): written
First periodical evaluation:
Second periodical evaluation:

Final exam: oral or written (includes one periodical evaluation)

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Збирка закони од областа на ветеринарното здравство Управа за ветеринарство МЗШВ
2. Законот за безбедност на храната,
3. Законот за заштита на потрошувачите
4. Бунчиќ, С. (2006) Integrated Food Safety and Veterinary Public Health
5. Wilson W. G. (1997) Wilson’s practical meat inspection
6. Bremner, A., Johnston, M. (1996) Poultry Meat Hygiene and Inspection
7. www.pravo.org.mk
8. http://vetlex.taiex.be/</td></tr>
</table>

Course	**CHANGES IN LABORATORY PROFILE IN DISEASES OF PET ANIMALS**	**2 credit points**
Code	**FVM051**	
Year of study	**Fifth (V)**	
Semester	**Tenth（X）**	
Total teaching lessons	**15+15**	
Course type	Elective	
Prerequisities		
Author of the course program	ass. prof. Goran Nikolovski, PhD	
Realized by	ass. prof. Goran Nikolovski, PhD	
Purpose and objectives of the course program	*Definition of the course:* At a time when many expensive specific tests, such as At a time when many expensive specific tests, such as ultrasonic diagnostics, Doppler ultrasound, computer tomography, magnetic resonance are present in clinics, with varying degrees of development, clinical diagnosis remains the best surveillance tool for diseases in animals. It reveals the hidden pathological changes that often cannot be discovered with basic imaging methods (endoscopy, x-ray, ultrasound and physical examinations). *Position of the course in veterinary education:* this subject is going to give the basics to the future clinicians to integrate clinical signs and laboratory findings, in order to gain comprehensive diagnosis. it also provides systematical approach for integrating laboratory changes during the detection of the possible diagnosis. One of the most important elements, that future practitioners will meet are the differences between **static** and **dynamic** testing. ➢ **Static laboratory testing** - a standard approach to the diagnosis of diseases. Laboratory values of the patient are compared with a set of normal values gained from healthy population. Such an approach is available in all the books that describe tests for different disorders of the organs. However, this kind of test has limiting factors such as age, breed or environmental factors. ➢ **Dynamic laboratory testing** - this is a method of evaluation based on the changes that appear during the disease in certain laboratory profiles of individual patients. It is a good method for diagnostic of diseases, observation of the early response of therapy and detecting changes based on the age of patient. with this approach, laboratory tests are repeated in order to reveal the changes in the values. If animals have established normal values, the small changes in the values are extremely important. *Relations of the course with the curriculum:* although elective course, certain knowledge from the compulsory course is needed. It is it is recommended to be taken after finishing the Internal diseases of pet animals and equines. For listening of this course is recommended that the student has passed Pathophysiology, Bases of clinical and laboratory diagnostics, as well as Diagnostic imaging.	
Content overview	**Lectures** by teaching units, with different fund of lessons: • *Serum findings*: alkaline phosphates, amino acid ratio, ammonia, amylase, anion gap, aspartate transferase, bicarbonate, bile acids, bilirubin, blood urea nitrogen BUN, BUN:creatinine ratio, Ca, ionized Ca, adjustment of calcium :albumin, chlorides, chloride: phosphate ratio, cholesterol, creatinine phosphocinase/creatinine kinase, creatinine, gamma glutamil transpeptidase, globulin, glucagon toleration test, glucose, glucose toleration test, lipase, Mg, osmolarity, P, K, renal failure rate, Na, Na:Ca rate, triglycerides. **3 lessons** • *Digestive findings*: tripsine in feces, proteolysis activity in feces, fat absorption test, cytology in feces, **1 lesson** • *Urine findings*: bilirubin, cylindrical proteins, catheterization, crystal analyses with frozen urine, coloring, cortisol:creatinine ratio, crystals, cystocentesis, cytology examination, fractional excretion of potassium, fractional excretion of magnesium, fractional excretion of sodium, fractional excretion of phosphates, kenotic bodies, pH, proteins (albumins), protein:creatinine ratio, non-albumin proteinuria, red blood cells, sediment, specific weight, Tamm-Horsfall proteins, urine analyses, urobilinogen, white blood cells. **4 lessons** • *Special serology tests*: acetylcholine receptor antibodies, antinuclear antibody test, catecholamine, flow cytometry, lupus erzthematosus test, rheum factor, tumor necrosis factor **2 lessons** • *Diagnosis based on laboratory findings:* hypo/hypercalcaemia, hyperholesterosis,	

<table>
<tr><td></td><td>decrease in bicarbonates, hypo/hyperglycemia, sodium deficiency, hypo/hyperphosphatemia, hypo/hyperproteinemia, ammonia and bile acid increasing, BUN and creatinine increasing, increasing of lipase/amylase and trypsin like immunoreactivity, increasing of liver enzymes, hypo hyper potassium. 5 lessons

Practical part will supplement the theoretical part and are going to be related with the dynamic changes in the laboratory findings in different diseases of dogs and cats. Themes of the practical work are:
Diagnosis based on clinical signs: weakness, vomiting, seizures, polyuria/polydipsia, icterus, high body temperature, edema, abdominal effusions, diarrhea, abnormal bleeding, hemathuria, lipemia, spleen enlargement, lymphadenopathy, decrease of bone density. 5 lessons
Dynamic tests at diseases of kidneys, liver, general condition and hormones 5 lessons
Laboratory profiles of different diseases in dogs and cats - individual seminary work 5 lessons.</td></tr>
<tr><td>Organization</td><td>Theory classes: 1 lesson a week (total 15 lessons)
Practicals: 1 lesson a week (total lessons)</td></tr>
<tr><td>Teaching methods</td><td>Theory classes: interactive (lectures in large group with discussion and active participation of the students).
Practicals: practicals and other ways of work with smaller groups
Written assay: learning with use of referent literature and internet, preparing seminar work (assay/poster); presentation and discussion about the seminar work.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance on theory classes</td><td>10</td><td>15</td></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>12</td><td>20</td></tr>
<tr><td>Practicals</td><td>10</td><td>15</td></tr>
<tr><td>Final exam</td><td colspan="2">predicted*</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table>

* Final exam is predicted. Criterion for passing the final exam is gaining of 50% of points predicted with theory classes, seminars and practicals.</td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>*Final exam: student is obligated to pass the final exam orally or written.
Criterion for passing the final exam is gaining of 50% of points predicted with theory classes, seminars and practicals.

Final grade mark forming criteria:
<table>
<tr><th>Points</th><th>Grade mark</th></tr>
<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>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Laboratory profiles of small animal diseases, A guide to laboratory diagnosis-third edition Charles H. Sodikoff, Mosby publ. 2001</td></tr>
</table>

Course	**ULTRASONIC DIAGNOSIS OF REPRODUCTIVE DISORDERS IN COWS**	**2 credit points**
Code	**FVM052**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Toni Dovenski, PhD	

<table>
<tr><td>Realized by</td><td>prof. Toni Dovenski, PhD
ass. Branko Atanasov, MSc</td></tr>
<tr><td>Purpose and objectives of the course program</td><td>The aim of the course is to give students possibilities for practical application of ultrasonic diagnosis of the causes and forms of reproductive pathology in cows. The subject aim is to enable students to expand previously acquired knowledge in the field of reproduction. Students will have the opportunity independently to perform diagnosis and treatment of the common reproductive disorders in cows.</td></tr>
<tr><td>Content overview</td><td>1. Basic principles of ultrasound diagnosis of reproductive disorders in cows.
2. Diagnosis of disorders of ovarian function
3. Diagnosis of pathology of the uterus
4. Treatment methods for reproductive disorders</td></tr>
<tr><td>Organization</td><td>Seminars and practical work: 2 lessons a week (30 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Independently performing treatments under expert supervision and preparation of paper work using professional literature and internet, in order to encouraging the student for independent work and research.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>8</td><td>15</td></tr>
<tr><td>Written assay</td><td>52</td><td>85</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table></td></tr>
<tr><td>Evaluation of knowledge u оценување</td><td>Final grade mark forming criteria:
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<tr><td>85-92</td><td>9 (B)</td></tr>
<tr><td>93-100</td><td>10 (A)</td></tr>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>1. Мицковски Г.: Физиологија и патологија на репродукцијата. Ветеринарен Институт-Ветеринарен факултет, 2000, Скопје.
2. Arthur's veterinary reproduction and obstetrics. By David E. Noakes, Geoffrey H. Arthur, Timothy J. Parkinson, Gary C. W. England Contributor David E. Noakes, Geoffrey H. Arthur, Timothy J. Parkinson, Gary C. W. England Edition: 8, illustrated, Published by Elsevier Health Sciences, 2001 ISBN 0702025569, 9780702025563
3. Довенски Т. Usporedba ehograma jajnika s razinom progesterona i estradiola u krvi krava tijekom spolnog ciklusa u puerperiju i u jalovih krava, Disertacija, Zagreb 1997.
4. T. Dovenski, P. Trojacanec, Lj. Kocoski, V. Petkov, Lj. Mickov , B. Atanasov; Use of ultrasound imaging of the ovaries for early pregnancy diagnosis in dairy cows, Proceedings of the 1st Conference of the Balkan Network for the Animal Reproduction Biotechnology, 2009.</td></tr>
</table>

Course	**ADVANCED ANDROLOGY AND CRYOBIOLOGY**	**2 credit points**
Code	**FVM053**	
Year of study	**Fifth (V)**	
Semester	**Tenth (X)**	
Total teaching lessons	**30**	
Course type	Elective	
Prerequisities		
Author of the course program	prof. Toni Dovenski, PhD	
Realized by	prof. Toni Dovenski, PhD ass. Branko Atanasov, MSc	
Purpose and objectives of the course program	The aim of the course is to enable and introduce the students with the modern achievements in andrology and cryobiology, and to present the basic parameters that can be examined from the genetic material by sophisticated laboratory methods. The lectures include a presentation and demonstration of the modern methods used for testing the	

<table>
<tr><td></td><td>quality of genetic material prepared for application in the recipients, the latest procedures and protocols for its preparation and cryo-conservation, detailed introduction of the media used for this purpose and finally address its national and European legislation that regulates this field of veterinary medicine
During the course, the newest methods will be present theoretically, for examine the quality of genetic material, production and cryo-conservation of deep-frozen semen from different farms animals and associated animal and also practical insight into the intended curriculum material through laboratory exercises.</td></tr>
<tr><td>Content overview</td><td>1. Advanced andrology
biochemical and physical properties of ejaculate
microscopic and ultramicroscopic structure of spermatozoa
Assessment of basic quantitative parameters of the ejaculate
Examine the motility of the spermatozoa
Techniques for measuring the motility of the spermatozoa
Photo electric and electronic methods for examine the qualitative parameters of the ejaculates (CASA systems)
methods for testing the fertilize ability of the spermatozoa (hamster test, hypo-osmotic test, induction acrosomal reaction, induced agglutination of the sperm
introduction to local and EU legislation governing the quality of genetic material
2. Theory classes and practicals of cryobiology
media types for maintaining the ejaculates
fundamentals of biophysics cryobiology
methods for cryopreservation of ejaculates (emphasis on the development of this discipline)
cryopreservation of ejaculate from ruminants, boars, stallions, carnivores
a brief review of the methods for cryopreservation of ejaculates from other animals for commercial purposes</td></tr>
<tr><td>Organization</td><td>Seminars and practical work: 2 lessons a week (30 lessons)</td></tr>
<tr><td>Teaching methods</td><td>Independently performing treatments under expert supervision and preparation of seminar paper using professional literature and internet, in order to encouraging the student for independent work and research.</td></tr>
<tr><td>Specific recommendations related with teaching</td><td>The student is obligated for active participation in all predicted activities for gaining points which are part of the final evaluation.

Scoring of the student’s activities:
<table>
<tr><th rowspan="2">Activity type</th><th colspan="2">Points</th></tr>
<tr><th>minimum</th><th>maximum</th></tr>
<tr><td>Attendance and activity (knowledge) on seminars</td><td>8</td><td>15</td></tr>
<tr><td>Written assay</td><td>52</td><td>85</td></tr>
<tr><td>Final exam</td><td colspan="2">not predicted</td></tr>
<tr><td>Total:</td><td>60</td><td>100</td></tr>
</table></td></tr>
<tr><td>Evaluation of knowledge и оценување</td><td>Final grade mark forming criteria:
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<tr><td>85-92</td><td>9 (B)</td></tr>
<tr><td>93-100</td><td>10 (A)</td></tr>
</table></td></tr>
<tr><td>Basic teaching aids</td><td>Hafez E.S.E. Reproduction in Farm Animals, 6th Edition, Lea & Febiger, Philadelphia, 1993
Ian R. Gordon Reproductive technologies in farm animals Published by CABI, 2004 ISBN 0851998623, 9780851998626</td></tr>
</table>