UNIVERSITY OF ZAGREB
FACULTY OF VETERINARY MEDICINE
Heinzelova 55
Tel. 01/2390 179
Division: Basic and preclinical science
Department / Clinic: Department of Physiology and Radiobiology
Email: mvilic@vef.hr

28 August 2018

COURSE SYLLABUS

Course name: Radiation Hygiene

Academic year 2018-19

Course leader: Marinko Vilić, DVM, PhD, Associate Professor

Teachers: Miljenko Šimpraga, DVM, PhD, full professor

Associate teachers: Jadranka Pejaković Hlede, DVM

First day of classes: 28 November 2018

Last day of classes: 18 January 2019

Timetable for LECTURES academic year 2018-2019

LECTURES				
Date	**Methodological unit**	**Teacher**	**Location / time**	**Literature**
28/11/2018	Introduction to radiation hygiene	Marinko Vilić, DVM, PhD, Associate Professor	Department of Physiology and Radiobiology/14–16 h	(see the list of the required literature)
30/11/2018	Radioactive contaminations	Marinko Vilić, DVM, PhD, Associate Professor	Department of Physiology and Radiobiology/14–16 h	(see the list of the required literature)
4/12/2018	Biologically significant radionuclides	Marinko Vilić, DVM, PhD, Associate Professor	Department of Physiology and Radiobiology/11–13 h	(see the list of the required literature)
7/1/2019	Effects of ionizing radiation upon animals and humans	Marinko Vilić, DVM, PhD, Associate Professor	Department of Physiology and Radiobiology/10–12 h	(see the list of the required literature)
9/1/2019	Methods of radioactive decontamination; Conservation of food by ionizing radiation	Marinko Vilić, DVM, PhD, Associate Professor	Department of Physiology and Radiobiology/10–12 h	(see the list of the required literature)

Timetable for SEMINARS academic year 2018-2019

SEMINARS					
Date	**Methodological unit**	**Teacher**	**Group**	**Location / time**	**Literature**

Timetable for PRACTICALS academic year 2018-2019

PRACTICALS						
Date	**Methodological unit**	**Teacher**	**Type of practical**	**Group**	**Location / time**	**Literature**
3/12/2018	Radiation Quantities and Units	Marinko Vilić, DVM, PhD, Associate Professor	Exercise in practicum	1	Department of Physiology and Radiobiology/10–12 h	(see the list of the required literature) PowerPoint presentation Handouts
13/12/2018	Personnel dosimeters-methods	Marinko Vilić, DVM, PhD, Associate Professor	Exercise in practicum	1	Department of Physiology and Radiobiology/13–15 h	(see the list of the required literature) PowerPoint presentation Handouts
14/12/2018	Personnel dosimeters-practical	Marinko Vilić, DVM, PhD, Associate Professor	Exercise in practicum	1	Department of Physiology and Radiobiology/12–14 h	(see the list of the required literature) PowerPoint presentation Handouts
7/1/2019	Radiation detectors-methods	Marinko Vilić, DVM, PhD, Associate Professor	Exercise in practicum	1	Department of Physiology and Radiobiology/12–14 h	(see the list of the required literature) PowerPoint presentation Handouts
8/1/2019	Radiation detectors-practical	Marinko Vilić, DVM, PhD, Associate Professor	Exercise in practicum	1	Department of Physiology and Radiobiology/12–14 h	(see the list of the required literature) PowerPoint presentation Handouts
9/1/2019	Gamma ray spectrometry	Marinko Vilić, DVM, PhD, Associate Professor	Exercise in practicum	1	Department of Physiology and Radiobiology/12–14 h	(see the list of the required literature) PowerPoint presentation Handouts
15/1/2019	Radiation protection-calculations	Marinko Vilić, DVM, PhD, Associate Professor	Exercise in practicum	1	Department of Physiology and Radiobiology/12–14 h	(see the list of the required literature) PowerPoint presentation Handouts

16/1/2019	Radiation protection-Radiation Shielding	Marinko Vilić, DVM, PhD, Associate Professor	Exercise in practicum	1	Department of Physiology and Radiobiology/10–12 h	(see the list of the required literature) PowerPoint presentation Handouts
17/1/2019	Non-ionizing radiation-instrumentation	Marinko Vilić, DVM, PhD, Associate Professor	Exercise in practicum	1	Department of Physiology and Radiobiology/12–14 h	(see the list of the required literature) PowerPoint presentation Handouts
18/1/2019	Non-ionizing radiation-practical	Marinko Vilić, DVM, PhD, Associate Professor	Exercise in practicum	1	Department of Physiology and Radiobiology/14–16 h	(see the list of the required literature) PowerPoint presentation Handouts

STUDENT OBLIGATIONS

Lecture attendance	During semester a student must attend 5 lecture hours in order to gain minimal 3 points. The maximum number of points from this evaluation element is 6 (10 lecture hours).
Seminars attendance	
Practicals attendance	During semester a student must attend 14 exercise hours in order to gain minimal 8 points. The maximum number of points from this evaluation element is 12 (20 lecture hours). The points will be added if a student is justifiably absent from up to 30 % of the exercises.
Active participation in seminars and practicals	During the practical part of the lesson (exercises), the student will write five tests. For correct answers the student will get a maximum of 10 points. By one test the student will be able to collect a maximum of two points. The minimum number of points from this evaluation element is 5.
Final exam	In order to take the final exam a student must gain minimal 16 points from attending at lectures and exercises, active participation at exercises and minimal 20 points from continuous knowledge checking.
Examination requirements	Student requirements are defined in the Regulations on the Integrated Undergraduate and Graduate Study of Veterinary Medicine. Given the above, the student must acquire a minimum number of points from all assessment elements in order to take the final exam. **Article 45:** a student can justifiably be absent from up to 50 % of the lectures; 30% of the seminars and 30 % of the exercises.

GRADING AND EVALUATING STUDENT WORK

Continuous knowledge-checking (mid-terms)	During the course of the Radiation Hygiene one assessment of knowledge (colloquia) will be organized. The colloquium includes content (subjects) of exercises. The maximum number of points scored from this grading element is 32 points and the minimum is 20 points. A student who does not achieve the necessary points during the course of instruction is entitled to three times access to a correctional colloquium that will be organized in certain terms. Colloquium date: 22 January 2019 8:30-10 h The terms of repeated colloquium during the winter exam period of the academic year 2018/2019 will be held according to the following schedule: 29 January 2019 (10-11:30 h) 5 February 2019 (10-11:30 h) 12 February 2019 (10-11:30 h)
Final exams (dates)	31/1/2019; 14/2/2019
Form of final exam	Written exam

LITERATURE

Obligatory literature	Vilić, M. (2014): RADIATION HYGIENE, Selected chapters of radioecology, radiobiology and radiation hygiene. Faculty of Veterinary Medicine, Zagreb. IAEA (2010): Radiation biology: a handbook for teachers and students Howard, B. J., N. A. Beresford, G. Voigt (2001): Countermeasures for animal products: a rewiew of effectiveness and potential usefulness after an accident. J. Environ Radioactivity 56, 115-137. Statkiewicz-Sherer, M. A.. P. J. Visconti, E. R. Ritenour (2002): Radiation protection. 4th ed. Mosby, Inc. St. Louis.
Optional literature	Travis E. L. (1989): Primer of medical radiobiology. 2nd ed. Mosby, Inc. St. Louis. Eisenbud, M. (1997): Enviromental Radioactivity. 5th ed. Academic Press. London. Hall, J. E. (2000): Radiobiology for the radiologist. 5th ed. Lippincott Williams & Wilkins. Philadelphia-Baltimore-New York-LondonBuenos Aires-Hong Kong-Sydney-Tokyo.

OBJECTIVES AND LEARNING OUTCOMES

Course objectives	At the Radiation hygiene course students will learn how to be able to (1) protect their selves and their associates from radioactive contamination and irradiation; (2) use detectors of ionising radiation and dosimeters, detect ionising radiation, determine its type and calculate the radiation dose (3) to use high frequency spectrum analyzer and radiofrequency meters and to calculate the exposure limits (4) protect the housings, animal habitats, domestic animals, animal feed and foodstuff from radioactive contamination and radiation (5) perform decontamination of domestic animals, animal feed, meat, milk, water and other food of animal origin, animal habitats, various subjects and environment (soil, farmlands) and check-up the success of decontamination; (6) evaluate radiation hygiene properties of meat, milk and other food and their use as human food, and all intended to protect humans from radiation and radiation risks; (7) evaluate the risk of malignant diseases appearance in humans due to feeding with contaminated milk and meat; (8) conserve food by ionizing radiation. Besides, the students will obtain the basic knowledge about ionizing and non-ionizing (microwave) radiation effects on animals and humans. Both is necessary for course in radiology, nuclear veterinary medicine and for performing other activities in veterinary profession referring to electromagnetic radiation. Finally, without mastering this course, veterinarians are not legally allowed to perform X-ray examinations or examinations by application with radioactive isotopes (nuclear veterinary medicine). Neither is it allowed to perform veterinary inspection or other things relating to animal hygiene.
Learning outcomes	After successfully mastering the course students will be able to: 1) recognize the sources of ionizing radiation 2) describe the pathway of radioactive contamination and the biological effects of ionizing radiation 3) protect the housings, animal habitats, domestic animals, animal feed and foodstuff from radioactive contamination and radiation 4) perform decontamination of domestic animals, animal feed, meat, milk, water and other food of animal origin, animal habitats, various subjects and environment (soil, farmlands) and check-up the success of decontamination 5) evaluate radiation hygiene properties of meat, milk and other food 6) use the dosimeters and detectors of ionizing radiation and calculate the radiation dose 7) recognize food conserving by ionizing radiation 8) recognize the sources of non-ionizing (microwave) radiation and describe the biological effects

GRADING SCHEME

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

Course leader:

_____

Head of Department/Clinic:

_____

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

GRADING AND EVALUATION OF STUDENT WORK ON COURSES WITH LECTURES, SEMINARS and PRACTICALS

Type of activity	Minimum number of points	Maximum number of points
Lectures attendance	**3**	**6**
Seminar attendance	**4**	**6**
Practicals attendance	**4**	**6**
Active participation in seminars and practicals	**5**	**10**
Continuous knowledge checking (mid-terms)	**20**	**32**
Final exam	**24**	**40**
TOTAL	**60**	**100**

GRADING AND EVALUATION OF STUDENT WORK ON COURSES WITH LECTURES and SEMINARS

Type of activity	Minimum number of points	Maximum number of points
Lecture attendance	**3**	**6**
Practicals attendance	**8**	**12**
Active participation in practicals	**5**	**10**
Continuous knowledge checking (mid-terms)	**20**	**32**
Final exam	**24**	**40**
TOTAL	**60**	**100**

GRADING AND EVALUATION OF STUDENT WORK ON COURSES WITH SEMINARS and EXCERCISES

Type of activity	Minimum number of points	Maximum number of points
Seminar / practicals attendance	**11**	**18**
Active participation in seminars and practicals	**5**	**10**
Continuous knowledge checking (mid-terms)	**20**	**32**
Final exam	**24**	**40**
TOTAL	**60**	**100**