

2018./2019.

PHYSIOLOGY OF DOMESTIC ANIMALS II

UNIVERSITY OF ZAGREB
FACULTY OF VETERINARY MEDICINE
Basic and preclinical science division
Department for physiology and radiobiology
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Ur.br.:

Zagreb, 10th January 2019

COURSE SYLLABUS

Course name: Physiology of domestic animals II

Academic year 2018/19

Head teacher: Miljenko Šimpraga, DVM, PhD, full professor

Teachers: Miljenko Šimpraga, DVM, PhD, full professor; Suzana Milinković Tur, DVM, PhD, full professor;
Jasna Aladrović, DVM, PhD, associate professor, Ana Shek Vugrovečki, DVM, PhD, assistant professor; Lana Vranković DVM,
PhD, assistant professor, Ivona Žura Žaja DVM, PhD, assistant professor

Associate teachers:

Jadranka Pejaković Hlede, DVM

Begin at: 25th February 2019

End at: 5th June 2019

	
79154	REPUBLIKA HRVATSKA
Veterinarski fakultet u Zagrebu	
Primljeno:	15.01.2019
Klasifikacijska oznaka	Org. jed.
602-04/19-23/13	251-61-32;
Uredbeni broj	Prilozi Vrijednost
251-61-06-19-01	0 -

Timetable for LECTURES academic year 2018./2019.

LECTURES				
Date	Methodological unit	Teacher	Location / time	Literature
25/2/2019	Cardiovascular system Physiological characteristics of the cardiovascular system in domestic animals Physiological characteristics of the heart muscle The conduction system	Ivona Žura Žaja DVM, PhD, assistant professor	Department of Physiology and Radiobiology 12-14h	(see the list of the required literature)
26/2/2019	Cardiovascular system The Phases of the Cardiac Cycle Electrical and mechanical changes in the heart Correlation of the heart excitation and contraction Changes of pressure and volume Sound changes Flow through heart	Ivona Žura Žaja DVM, PhD, assistant professor	Department of Physiology and Radiobiology 14-16h	(see the list of the required literature)
27/2/2019	Cardiovascular system Stroke Volume Cardiac output Regulation of the heart rate: a) autoregulation b) humoral regulation c) endocrine and nerve regulation	Ivona Žura Žaja DVM, PhD, assistant professor	Department of Physiology and Radiobiology 8-10h	(see the list of the required literature)
28/2/2019	Cardiovascular system Circulation Arterial blood pressure Venous blood pressure Regulation of blood pressure Peripheral circulation: a) Arterial circulation b) Capillary circulation c) Venous circulation	Ivona Žura Žaja DVM, PhD, assistant professor	Department of Physiology and Radiobiology 14-16h	(see the list of the required literature)

	Regulation of peripheral circulation			
05/3/2019	Respiratory system Functions of respiratory system Ventilation mechanic Ventilation types Ventilation frequency	Ana Shek Vugrovečki, DVM, PhD, assistant professor	Department of Physiology and Radiobiology 10-12h	(see the list of the required literature)
18/3/2019	Respiratory system Gases exchange in lungs Gases transport in the blood Tissue gases exchange Regulation of breathing	Ana Shek Vugrovečki, DVM, PhD, assistant professor	Department of Physiology and Radiobiology 14-16h	(see the list of the required literature)
25/3/2019	Digestion Functions of digestion Characteristics of the digestion in animals with simple stomach and ruminants Hunger and thirst Food intake Digestion In the mouth: mastication and salivation Salivary secretion Swallowing process	Ana Shek Vugrovečki, DVM, PhD, assistant professor	Department of Physiology and Radiobiology 14-16h	(see the list of the required literature)
26/3/2019	Digestion in the simple stomach Functions of the stomach mucosa Composition and function of the gastric juice Regulation of the gastric juice secretion Vomiting	Ana Shek Vugrovečki, DVM, PhD, assistant professor	Department of Physiology and Radiobiology 8-10h	(see the list of the required literature)
29/3/2019	Rumen digestion Basic principle of ruminant-micro population symbiosis Rumen motility Water-dry substances ratio Functions of the oesophageal groove	Jasna Aladrović, DVM, PhD, associate professor	Department of Physiology and Radiobiology 10-12h	(see the list of the required literature)

	Gases in the rumen			
2/4/2019	Rumen digestion pH effect on the digestion Feeding Role of bacteria and infusoria in the digestion Rumen digestion efficiency	Jasna Aladrović, DVM, PhD, associate professor	Department of Physiology and Radiobiology 8-10h	(see the list of the required literature)
3/4/2019	Rumen digestion Metabolism of Carbohydrates Metabolism of Proteins Metabolism of Lipids Ruminohepatic circle of nitrogen Vitamins synthesis Metabolic pathways of volatile fatty acids Abomasum digestion	Jasna Aladrović, DVM, PhD, associate professor	Department of Physiology and Radiobiology 13-15h	(see the list of the required literature)
8/4/2019	Intestinal digestion Stomach-duodenum relationship pH changes and food role Bile function Functions of the pancreatic juice Regulation of absorption in the small intestine	Lana Vranković DVM, PhD, assistant professor	Department of Physiology and Radiobiology 8-10h	(see the list of the required literature)
9/4/2019	Intestinal digestion Intestinal polypeptide Bile secretion regulation Pancreatic juice secretion regulation Intestinal absorption	Lana Vranković DVM, PhD, assistant professor	Department of Physiology and Radiobiology 14-16h	(see the list of the required literature)
15/4/2019	Excretory function of kidneys Nephron physiology Kidney filtration and filtration factors	Jasna Aladrović, DVM, PhD, associate professor	Department of Physiology and Radiobiology 8-10h	(see the list of the required literature)
16/4/2019	Urine formation Glomerular filtrate Nephron reabsorption Nephron secretion	Jasna Aladrović, DVM, PhD, associate professor	Department of Physiology and Radiobiology 8-10h	(see the list of the required literature)
30/4/2019	Carbohydrate metabolism Glucose functions Maintaining glycaemia	Ana Shek Vugrovečki, DVM, PhD, assistant	Department of Physiology and Radiobiology	(see the list of the required literature)

	Glycaemia regulation: a) endocrine b) nerve Alterations in glycaemia Functions of glucagon Carbohydrate metabolism mechanisms	professor	8-10h	
3/5/2019	Protein Metabolism Classification of body proteins Half-life of body proteins Protein synthesis and degradation in different animal species regulation	Lana Vranković DVM, PhD, assistant professor Jasna Aladrović, DVM, PhD, associate professor	Department of Physiology and Radiobiology 11-13h	(see the list of the required literature)
8/5/2019	Lipids metabolism Body fats functional classification Storage fat (lipogenesis) Building fats (function and metabolism of phospholipids, glycolipids and cholesterol) Transport fats Lipids metabolism regulation	Ivona Žura Žaja DVM, PhD, assistant professor	Department of Physiology and Radiobiology 14-16h	(see the list of the required literature)
15/5/2019	Vitamins metabolism Role of minerals in synthesis and metabolism of tissues; Vitamins metabolism Vitamins resorption Vitamins deposition Water soluble and fat soluble vitamins specificities	Ivona Žura Žaja DVM, PhD, assistant professor	Department of Physiology and Radiobiology 8-10h	(see the list of the required literature)
16/5/2019	Minerals metabolism Role of minerals in synthesis and tissues metabolism Microelement metabolism - Na, K, Ca, P, Mg, S Microelement metabolism Fe, Cu, ZN, Mo, Co, Se, I	Ana Shek Vugrovečki, DVM, PhD, assistant professor	Department of Physiology and Radiobiology 13-15h	(see the list of the required literature)
24/5/2019	Mammary gland Mammary gland functions	Lana Vranković DVM, PhD, assistant	Department of Physiology and Radiobiology	(see the list of the required literature)

	Mammary gland blood supply and lymph drainage Mammary gland development Lactation Suckling and milking Lactation duration Lactation curves Factors effecting lactation Milk composition	professor	12-14h	
27/5/2019	Egg-laying physiology Egg composition Egg development Oviposition Factors effecting egg-laying	Jasna Aladrović, DVM, PhD, associate professor	Department of Physiology and Radiobiology 13-15h	(see the list of the required literature)
29/5/2019	Thermoregulation and skin physiology	Jasna Aladrović, DVM, PhD, associate professor	Department of Physiology and Radiobiology 10-11h	(see the list of the required literature)

Timetable for SEMINARS academic year 2018./2019.

SEMINARS					
Date	Methodological unit	Teacher	Group	Location / time	Literature
6/3/2019	Cardiovascular system Cardiovascular receptors Cardiac muscle metabolism and cardiac work Heart failure Hemodynamic Lymph system	Ivona Žura Žaja DVM, PhD, assistant professor		Department of Physiology and Radiobiology 10-12h	(see the list of the required literature)
8/3/2019	Circulatory	Ivona Žura Žaja DVM,		Department of	(see the list of the required

	system Coronary circulation Pulmonary circulation Hepatic circulation Circulatory shock – physiological causes	PhD, assistant professor		Physiology and Radiobiology 10-12h	literature)
19/3/2019	Respiratory system Coughing, sneezing Pulmonary ventilation Lung volumes Lung capacities Respiration in fish Respiration in birds	Ana Shek Vugrovečki, DVM, PhD, assistant professor		Department of Physiology and Radiobiology 11-13h	(see the list of the required literature)
28/3/2019	Stomach digestion Stomach motility Digestion in fish Digestion in birds	Ana Shek Vugrovečki, DVM, PhD, assistant professor		Department of Physiology and Radiobiology 10-12h	(see the list of the required literature)
4/4/2019	Forestomach digestion Rumen contractions Reticulum contractions Omasum contractions Abomasum contractions Forestomach contraction regulatory mechanisms	Jasna Aladrović, DVM, PhD, associate professor		Department of Physiology and Radiobiology 13-15h	(see the list of the required literature)
11/4/2019	Intestine digestion Colon digestion	Lana Vranković DVM, PhD, assistant professor		Department of Physiology and Radiobiology 8-10h	(see the list of the required literature)
17/4/2019	Urine Renal acid-base regulation Bird excretion	Jasna Aladrović, DVM, PhD, associate professor		Department of Physiology and Radiobiology 8-10h	(see the list of the required literature)

7/5/2019	Carbohydrate metabolism Metabolic control of glucose degradation Pentose phosphate pathway Gluconeogenesis Carbohydrate metabolism in connection with other metabolism pathways Protein metabolism Protein synthesis and degradation in different animal species	Ana Shek Vugrovečki, DVM, PhD, assistant professor Lana Vranković DVM, PhD, assistant professor		Department of Physiology and Radiobiology 11-13h	(see the list of the required literature)
14/5/2019	Lipid metabolism Nutrient utilization in the postresorbtive state The role of fat in lipid metabolism Liner in lipid metabolism	Ivona Žura Žaja DVM, PhD, assistant professor		Department of Physiology and Radiobiology 14-16h	(see the list of the required literature)
17/5/2019	Vitamins metabolism Fat-soluble vitamins metabolism Mineral metabolism Microelements as a coenzyme factor Minerals in cell metabolism	Ivona Žura Žaja DVM, PhD, assistant professor Ana Shek Vugrovečki, DVM, PhD, assistant professor		Department of Physiology and Radiobiology 13-15h	(see the list of the required literature)
21/5/2019	Exercise physiology Exercise effect on	Ana Shek Vugrovečki, DVM, PhD, assistant		Department of Physiology and	(see the list of the required literature)

	cardiovascular system Exercise effect on respiratory system Exercise effect on blood count Exercise effect on blood biochemistry	professor		Radiobiology 11-12h	
31/5/2019	Bioenergetics Bioenergetics basic principles Energy turnover Feed gross energy Digestible energy Metabolic energy Basal metabolic energy ATP synthesis in metabolism Production systems efficiency Bio-calorimetry Respiratory Quotient and its interpretation	Ivona Žura Žaja DVM, PhD, assistant professor		Department of Physiology and Radiobiology 8-10h	(see the list of the required literature)
4/6/2019	Antioxidant system Free radicals in physiology Free radicals effects Antioxidant <i>in vivo</i> synthesis and effect Antioxidant enzymes Non-enzymatic antioxidant molecules Oxidative stress	Ivona Žura Žaja DVM, PhD, assistant professor		Department of Physiology and Radiobiology 12-14h	(see the list of the required literature)

Timetable for EXERCISES (PRACTICALS) academic year 2018./2019.

EXERCISES/PRACTICALS						
Date	Methodological	Leader	Type of exercises	Group	Location / time	Literature

	unit		(čl. 34 Pravilnika o integriranom studiju)			
11/3/2019	ECG Depolarization and repolarization ECG standard leads ECG interpretation Computer simulation Cardiac automatism and rhythmicity Auto-rhythmicity Refractory period Extra systole	Teachers and associates	Construction exercise – computer simulations Exercise in practicum		practical hall, Department of Physiology and radiobiology 14-17h	(see the list of the required literature)
20/3/2019	Einthoven's triangle Bipolar recordings	Teachers and associates	Construction exercise – computer simulations Exercise in practicum		practical hall, Department of Physiology and radiobiology 14-17h	(see the list of the required literature)
21/3/2019	Blood pressure measurement Blood vessels and blood pressure - computer simulations Flow speed, peripheral resistance, viscosity, systole, diastole, diastolic volume, systolic volume, stroke volume, cardiac output Cardiovascular dynamics Blood pressure effects Tissue differences Factor of blood flow Blood vessels diameter	Teachers and associates	Construction exercise – computer simulations Exercise in practicum		practical hall, Department of Physiology and radiobiology 8-11h	(see the list of the required literature)

	Stroke volume and blood flow					
27/3/2019	Spirometry Explain terms: breathing, exhale, inhale, maximal exhale Pulmonary volume Pulmonary capacity Tidal volume. Vital capacity Expiratory reserve volume, inspiratory reserve volume, residual volume, pneumothorax hyperventilation Variations in breathing and their effect	Teachers and associates	Exercise in practicum Construction exercise – computer simulations		practical hall, Department of Physiology and radiobiology 13-16h	(see the list of the required literature)
1/4/2019	Oral digestion Salivary amylase Effects of external factors on salivary amylase activity Salivary amylase activity by Wohlgemuth	Teachers and associates	Laboratory exercise		practical hall, Department of Physiology and radiobiology 14-17h	(see the list of the required literature)
5/4/2019	Frequency and quality of rumen contractions	Teachers and associates	Clinical exercise		Department of Physiology and radiobiology+stables of Clinic for obstetrics and reproduction 12-15	(see the list of the required literature)
08/4/2019	Stomach and intestine digestion Pepsin activity Effect of external factors on pepsin activity	Teachers and associates	Laboratory exercise		practical hall, Department of Physiology and radiobiology 12-15h	(see the list of the required literature)

	Gastric juice titration Pancreatic lipase activity					
10/4/2019	Ruminants digestion Nitrite degradation urea lactic acid Milk digestion	Teachers and associates	Laboratory exercise		practical hall, Department of Physiology and radiobiology 13-16h	(see the list of the required literature)
17/4/2019	Urine Physical analysis Urine sediment analysis Chemical analysis of urine sugars proteins bile colours bile acids blood pigment ketones indican	Teachers and associates	Laboratory exercise		practical hall, Department of Physiology and radiobiology 14-17h	(see the list of the required literature)
2/5/2019	Acid-base regulation	Teachers and associates	Construction exercise – computer simulations		Department of Physiology and radiobiology 11-14h	(see the list of the required literature)
9/5/2019	Computer simulations of renal excretion Nephron blood supply Factors effecting glomerular filtration Maximal transport by carriers Actions of ADH and aldosterone Mechanisms for forming concentrated urine	Teachers and associates	Construction exercise – computer simulations		Department of Physiology and radiobiology 11-14h	(see the list of the required literature)

13/5/2019	Serum carbohydrates and protein analysis Serum glucose determination Total protein and albumin determination Serum protein electrophoresis	Teachers and associates	Laboratory exercise		practical hall, Department of Physiology and radiobiology 11-14h	(see the list of the required literature)
15/5/2019	Serum lipids determination Hepatic enzymes AST, ALT and GGT determination Total bilirubin determination	Teachers and associates	Laboratory exercise		Department of Physiology and radiobiology 11-14h	(see the list of the required literature)
22/5/2019	Exercise physiology Energy metabolism during exercise Hormonal regulation during exercise Neuromuscular system during exercise Astrand's test Blood lactate concentration determination Anaerobic threshold	Teachers and associates	Laboratory exercise		practical hall, Department of Physiology and radiobiology 14-17h	(see the list of the required literature)
28/5/2019	Reproduction physiology Gonad activity hormonal regulation puberty, reproduction physiology in male and female, gravidity	Teachers and associates	Laboratory exercise		practical hall, Department of Physiology and radiobiology 13-16h	(see the list of the required literature)
5/6/2019	Behaviour physiology Hormonal effect in feeding behaviour, sexual and maternal	Teachers and associates	Exercise in practicum		practical hall, Department of Physiology and radiobiology	(see the list of the required literature)

	behaviour, learning and memory. Student's presentations				12-15h	
6/6/2019	Bio-energetics Nutrient and energy pathways Energy value of nutrients Gross energy, metabolic energy Feed specific dynamics Net energy ATP role in metabolism Energy metabolism during resting Production processes efficiency	Teachers and associates	Exercise in practicum		Department of Physiology and radiobiology 12-15h	(see the list of the required literature)

About possible course syllabus' amendments the students will be informed in time.

STUDENT RESPONSABILITIES

Attendance at lectures	During semester a student must attend 23 lecture lessons in order to gain minimal 3 points. The maximum number of points from this evaluation element is 6.
Attendance at seminars	During the course the student must be present at 18 seminar lessons to achieve a minimum of 4 points. The maximum score of this evaluation element is 6 points. If the student, upon the completion of the course, makes up for nonattendance (excused and approved) of the missed seminar from the first try, he gains points which are added to the previously gained points. If the student makes up for the unattended seminars in further tries the points are not added.

Attendance at exercises	During semester a student must attend 42 exercise lessons in order to gain minimal 4 points. The maximum number of points from this evaluation element is 6. If the student, upon the completion of the course, makes up for nonattendance (excused and approved) of the missed exercise (excused and approved), points are added to the gained ones. If the student makes up for the unattended exercise in further tries, the points do not count.
Active participation in seminars and exercises	During the 25 hours of seminars and 60 hours of exercises (practicals), the student must successfully complete scheduled tasks and receive teacher's signature for the completed assignments. Each neatly done and signed task is worth 0.177 points. During the exercise the student can achieve a total of 3 points. During the course, the student's activity is evaluated during the exercises. For six positive answers, the student earns an additional 6 points. To create and successfully present two seminars, the student earns a maximum of 2 points per seminar and a total of 4 points. During the practical and seminar part of the course, the student must achieve a minimum of 5 points and can achieve the maximum of 10 points. (6 activity+2*2seminars)
Final exam	The final exam starts with a student's short analysis of results gained from the first four evaluation elements. At the final exam the student answers the questions in oral form. The final exam comprises the material from endocrinology and it estimates the capability of a student to connect physiological processes. The maximum gained number of points at the final exam is 40 points. Regardless the gained number of points from the first four evaluation elements, the student must show minimal knowledge at the final exam in order to earn minimal 24 points. If the student did not satisfy the final part of the exam, he/she can retake the final exam in previously determined terms.
Conditions for obtaining signatures	Student obligations are defined with 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 elements of assessment in order to pass the course. Article 45: student can reasonably be absent from teaching activities, as follows: up to 50 % of the lectures; up to 30% of the seminars and 30 % of the exercises.

GRADING AND EVALUATING STUDENT WORK

Continuous knowledge checking	During the course of the Physiology of Domestic Animals II, two assessment of knowledge (colloquia) will
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(colloquia)	<p>be organized. The first colloquium includes cardiovascular and respiratory physiology and the second examination involves the digestion end excretory physiology. At each colloquium, the student must achieve at least 10 points to achieve the required 20 points. The maximum number of points scored from this grading element is 32 points.</p> <p>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.</p> <p>The terms of the colloquium from the Physiology of Domestic Animals II in the academic year 2018/2019. Cardiovascular and respiratory systems physiology (April 10th 2019) at 11h Digestive and excretory systems physiology (May 21th 2019) at 10h</p> <p>The terms of repeated colloquium from the Physiology of Domestic Animals I during the winter semester and the winter exam period of the academic year 2017/2018 will be held according to the following schedule: June 11th 2019 at 11 am June 18th 2019 at 11 am September 3rd 2019 at 11 am</p>
Final exams (dates)	June 28th 2019; July 12th 2019; September 2nd 2019; September 16th 2019
Form of final exam	oral exam

LITERATURE

Obligatory literature	<ol style="list-style-type: none"> 1. Cunningham, J. G.: Textbook of veterinary physiology. 3rd edition, W. B. Saunders Company, 2002. 2. Dukes' physiology of domestic animals (William O. Reece, Ed.). The 12th ed. Cornell University Press. Ithaca and London, 2004. 3. Sjaastad Ø. V., O. Sand, K. Hove: Physiology of Domestic Animals. The 12nd ed. Scandinavian veterinary press, 2010. 4. Vander, A. J., J. H. Sherman, D. S. Luciano: Human physiology. The mechanisms of body function. The 5th ed. McGraw-Hill Publishing Comp. New York, 1990.
Supplementary literature	<ol style="list-style-type: none"> 1. Feldman, B. F., J. G. Zinkl, N. C. Jain: Schalm's Veterinary Hematology. 5th ed. Lippincott

- Williams & Wilkins, 2000.
2. Kaneko, J. J., J. W. Harvey, M. L. Bruss: Clinical Biochemistry of Domestic Animals. Academic Press. San Diego, Boston, New York, Sydney, Tokyo, 1987.
 3. Payne, J. M., S. Payne: The Metabolic Profile Test. Oxford University Press. Oxford, New York, Tokyo, 1987.
 4. Schmidt-Nielsen, K.: Animal Physiology. Adaptation and Environment. Cambridge University Press, 1997.

OBJECTIVES AND LEARNING OUTCOMES

Course objectives	Course of Physiology of domestic animals II qualifies students for progressive development of knowledge from physics, chemistry, biochemistry, histology and anatomy and understanding of basic principles and facts of physiological processes from cell to the total body, understanding and correlating of regulatory mechanisms, understanding of homeostasis keeping, acid-base balance, development of knowledge and skills related to body liquids in special regard of blood physiology, understanding of physiological function of muscle/nervous system, physiological function of hormones in context of the whole homeostatic system. The goal is to provide the progressive development of skills in collecting, preparing, and interpreting the results of the different sample analysis, to provide modern trends in veterinary physiology so that students will achieve a working knowledge of physiology; development of abilities for interpretation, and conclusion about information; the abilities of searching for information in the literature.
Learning outcomes	<p>After successfully mastering the course students will be able to:</p> <ul style="list-style-type: none"> - describe the basic principles and the facts of the physiological processes from the cell to the whole organism, - explain the physiological functions of the blood, nervous and muscular system and hormones, - recognize the importance of maintaining continuous function of blood, nerve and muscle tissue, - connect the regulatory mechanisms maintain homeostasis and acid-base balance; - use the skills of obtaining and analyzing whole blood, plasma, and serum - to evaluate whether the obtained values are within physiological limits for certain species of domestic animals, and - to conclude how blood tests can indicate certain pathological changes or certain disease

stages

GRADING OF STUDENT WORK

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

Head teacher:

u.z. Ana Štok Vignovčan

Head of Department/Clinic:



Note: The head teacher is required to submit a Course Syllabus to all teachers and associates on the Course.

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

Type of activity	Minimal number of points	Maximal number of points
Attendance at lectures	3	6
Attendance at seminars	4	6
Attendance at exercises	4	6
Active participation in seminars and exercises	5	10
Continuous knowledge checking (colloquia)	20	32
Final exam	24	40
TOTAL	60	100

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

Type of activity	Minimal number of points	Maximal number of points
Attendance at lectures	3	6
Attendance at exercises	8	12
Active participation in exercises	5	10
Continuous knowledge checking (colloquia)	20	32
Final exam	24	40
TOTAL	60	100

**GRADING AND EVALUATION OF STUDENT WORK ON COURSES WITH SEMINARS and
EXERCISES**

Type of activity	Minimal number of points	Maximal number of points
Attendance at seminars / exercises	11	18
Active participation in seminars and exercises	5	10
Continuous knowledge checking (colloquia)	20	32
Final exam	24	40
TOTAL	60	100