35301 – Veterinary physiology II (6 CFU; 66 hours: Module 1 – lessons and seminars - 58 hours; Module 2 – practices – 8 hours – four groups of students)			
Module 1 – Lessons and seminars			
Learning outcomes: At the end of the module the student will have understood and will know in detail the fundamental mechanisms regulating the function of: skeletal, smooth and cardiac muscle, cardiovascular system, kidney and urinary system; respiratory system in a comparative way in domestic species.			
Topics and skills to acquire	Topic	Specific content	Hours
1. VOLUNTARY AND INVOLUNTARY MUSCLE ACTIVITY (TOT. 8 HOURS)	Skeletal and smooth muscle	Course structure description; explanation of the exam (modalities, time, propaedeutic activities, course frequency). The organization of the contractile system; proteins involved in muscle contraction and its regulation.	2
		The neuromuscular transmission (synapses), the electrical and contractile activity of the skeletal muscle. Simple shock and tetanus. Muscle energy metabolism	2
		Nervous control of muscle contraction; the mechanical action of the muscle on the bone segments, locomotion. The smooth muscle	2
	Clinical reasoning	Physiological gait, lameness and neurological examination	2
2. CARDIOCIRCULATORY SYSTEM (TOT. 23 HOURS)	Cardiac muscle and its electrical activity	Anatomical-functional differences between cardiac muscle and smooth and skeletal muscle. Pace maker cells and contractile cells; the membrane potential and the cardiac action potential.	2
		Hierarchy within pace maker cells. Normal and para physiological heart rhythm. Excitation-contraction coupling. Cardiac excitability and its consequences. Effects of the autonomic nervous system on cardiac function.	3

	Cardiac cycle	Coordinated organization of cardiac contractile events: the cardiac cycle. Systole and diastole. Ventricular volumes. Importance of the duration of the diastolic phase. Frequency and cardiac output range in the different domestic species. Cardiac output right and left. Length tension curve. Maestrini-Starling Law of the heart - Self-regulation of cardiac output	3
	Hemodynamics. Characteristics of the arteries, capillaries and veins	Characteristics of the arteries. Laplace's law for the cylinder and Pascal's laws	2
		Poiseuille's law. Total peripheral resistance, blood pressure.	2
		Exchanges across the capillary wall: capillaries at heart level, under the heart, above the heart. The lymphatic system	2
		The venous function and venous pulse (sphygmogram)	2
	Regulation of arterial pressure	Baroreceptors, Volo-receptors and Chemoreceptors. Pressure reflexes; emotional state cardiovascular activity	2
	Particular circulation and thermoregulation	Pulmonary, cerebral, coronary and fetal circulation. Skin circulation and thermoregulation	3
	Clinical reasoning	Cardiac physiology and clinical cardiology	2
3. RESPIRATORY FUNCTION (TOT.13 HOURS)	Respiratory mechanics. Inhalation and exhalation	Airways, resistance to flow, lung elasticity; the pleurae. Expiration and surfactant factor	3
	Ventilation	Dead space, tidal volume, vital capacity, pulmonary ventilation, alveolar ventilation.	1
	Gas exchange; transport of	Gas exchange at alveolar and tissue level. Oxygen transport; hemoglobin and	3

	carbon dioxide and oxygen	saturation curves; transport of carbon dioxide	
	Chemical and nervous regulation of breath	The chemical regulation of respiration. The chemoreceptors. Central and peripheral effects of oxygen, carbon dioxide and pH on respiration. Bulb-Pontine regulatory centers	2
	Clinical reasoning	Clinical approach to dyspnea	2
3. RENAL AND URINARY TRACT FUNCTION (TOT. 15 HOURS)	The nephron: anatomical and functional organization.	The nephron. Hydrostatic pressure, oncotic pressure and endo-capsular pressure at the renal level. The net filtering pressure and glomerular filtration rate. The molecular filter. Characteristics of the ultrafiltrate. Variations in the amount of ultrafiltrate.	2
	Autoregulation of renal blood flow	Myogenic theory and juxtaglomerular theory	1
	Function of the proximal tubule	Tubular reabsorption and secretion in the proximal tubule	2
	Henle loop	Henle loop and the creation of a hypertonic medulla. The vasa recta as counter-current exchangers.	2
	Hormonal regulation of tubular reabsorption	The hypertonic medulla and the recovery of water by the collecting tubule. ADH, synthesis, secretion and actions. Combined role of hypertonic medulla and ADH for water-salt balance. The distal convoluted tubule. Mechanisms of action, synthesis and actions of aldosterone at the distal tubule level. The regulation of aldosterone secretion.	3
	Clearance and micturition	Clearance and factionary excretion; micturition and its regulation	2
	Clinical reasoning	Renal and urinary function and clinical aspects in domestic species	2

Module 2 - Practices			
Learning outcomes: At the end of the module the student will have acquired the skills to perform and interpret a physiological ECG, to auscultate heart tones, measure blood pressure and perform a chemical-physical examination of some urinary parameters			
EVALUATION OF PHYSIOLOGICAL FUNCTIONS (TOT. 8 ORE)	Skeletal muscle physiology	Through a digital support (Virtual Physiology -SimMuscle), students will have the opportunity to perform interactive exercises on some aspects of skeletal muscle physiology such as excitation-contraction coupling, tetanic contraction, muscle fatigue and isometric-isotonic contraction.	1
	Physiology of the cardiovascular system	Auscultation of heart tones with the stethoscope. Evaluation of heart rate and arterial pulse.	1
		Electro Cardiogram in domestic specie - Practical test under physiological conditions. Analysis of the heart rate, and bases for the analysis of the P-QRS-T waves	2
		The blood pressure measurement under physiological conditions. Discussion on the problems in measuring blood pressure in pets and instruments to use.	2
	Physiology of the kidney and urinary system	Evaluation of some chemical-physical characteristics of simulated urine samples: pH, specific weight, glycosuria and proteinuria. Discussion on the physiological significance of the different measurements found	2