

Course Title	<b>Physiology II</b>			
Course Code	<b>VET-108</b>			
Course Type	Required			
Level	Undergraduate			
Year / Semester	Year 1/ Semester 2 (Spring)			
Teacher's Name	<b>Course Lead:</b> Dr Andreas Monoyios <b>Contributors:</b> Dr Catalina Cabrera			
ECTS	6	Lectures and tutorials/ <b>week</b>	5 hours	Practical / <b>semester</b>
Course Purpose and Objectives	<p>The main objectives of the course are:</p> <ul style="list-style-type: none"> <li>• To teach students about the form and function of animals and their bodily processes.</li> <li>• To introduce students to Physiology - the scientific investigation of animals' biological systems, along with how these systems operate.</li> <li>• To familiarize students with the anatomy and physiology of animals in order to diagnose and treat disease and dysfunctions.</li> <li>• To explain to students how organs, tissues, and other bodily structures work.</li> </ul>			
Learning Outcomes	<p>The body systems to be covered are: 1) Integumentary System 2) Endocrine System 3) Gastrointestinal System 4) Urinary System 5) Male Reproductive System and 6) Female Reproductive System</p> <p>The following list provides the learning objectives (LOBs) that will be covered in the lectures, tutorial and practicals of each week:</p> <p><b>Week 1 Integumentary System</b></p> <p><b>LOBs covered during lectures:</b></p> <ol style="list-style-type: none"> <li>1. Epidermis and dermis</li> <li>2. Subcutaneous tissue</li> <li>3. Cells of the epidermis: keratinocytes, melanocytes, dendritic cells, tactile epithelial cells (Merkel cells)</li> <li>4. Layers of the epidermis: stratum germinativum, stratum spinosum, stratum granulosum, stratum lucidum, stratum corneum</li> <li>5. Layers of the dermis: papillary layer, reticular layer</li> <li>6. Accessory structures of the integument: hair, hair follicles</li> <li>7. Hair growth</li> </ol> <p><b>Week 2, Week 3, and Week 4 Endocrine System</b></p> <p><b>LOBs covered during lectures:</b></p>			

8. Contrast the location and signaling pathways of membrane-bound and intracellular hormone receptors.
  9. Compare and contrast hormone actions that are exerted through changes in gene expression with those exerted through changes in protein activity, such as through phosphorylation.
  10. Contrast the signal transduction pathways involved in G-protein coupled receptors, receptor enzymes, and ligand-gated ion channels.
  11. Explain the effects of secretion, excretion, degradation, and volume of distribution on the concentration of a hormone in blood plasma.
  12. Describe tropic hormones and the function and control of pituitary target glands.
  13. Explain the principle of negative and positive feedback and feed forward control of hormone secretion.
  14. Outline the synthesis, regulation, storage, secretion, transport, target, mechanism of action, effect, and secretion of the key hormones associated with the hypothalamic–pituitary axis.
  15. Explain the role of the hypothalamus in temperature regulation.
  16. Outline the anatomy and function of the anterior and posterior pituitary glands.
  17. Outline the synthesis, regulation, storage, secretion, transport, target, mechanism of action, effect, and secretion of the key hormones associated with the thyroid gland, parathyroid gland, pancreas, kidney, adrenal gland, ovary, and testis.
  18. Describe thyroid hormone functions, secretion, feedback control, and hyperthyroid/hypothyroid states.
  19. Describe adrenal cortex hormone secretion and control.
  20. Describe the adrenal cortex, the renin-angiotensin system and mineralocorticoid effects on the kidney and blood pressure.
  21. Outline the role of the adrenal medulla in catecholamine secretion.
  22. Describe the role of the adrenal in stress response.
  23. Describe the role of steroid hormones, including vitamin D.
  24. Explain the role of pancreatic islets, peptide hormones, insulin, glucagon, somatostatin and neuroendocrine hormones.
  25. Describe pancreatic hormone actions on carbohydrate, fat and protein metabolism.
  26. Describe pancreatic hormone interactions with cortisol, epinephrine, and growth hormone.
- Week 5 and Week 6 Gastrointestinal System**
- LOBs covered during lectures:**
27. Differentiate the processes of ingestion, digestion, absorption,

secretion, and excretion for the major classes of nutrients (carbohydrates, proteins, fats) and state the location in the GI tract where each process occurs.

28. Describe the dynamic pressure changes that occur in the regions of the esophagus after initiation of the swallowing reflex and how this pressure changes propel a bolus of food from the mouth to the stomach.

29. Describe the functions of the duodenum, jejunum, ileum, large intestine and pancreas.

30. Explain the contribution of pancreatic secretion and bile in producing alkaline pH in the duodenum.

31. Describe liver function/acinar structure, synthetic and metabolic functions of hepatocytes, bile secretion, gallbladder function and the actions of cholecystokinin.

32. Describe the function of the jejunum, ileum, pancreas and pancreaticobiliary tree with respect to the digestion and absorption of food.

33. Describe the control of peristalsis by the enteric nervous system, endocrine and neural regulatory functions, including gastrointestinal (neuroendocrine) hormones.

34. Describe the sequence of events in the colon and anal sphincters occurring during reflexive defecation, differentiating those movements under voluntary control and those under autonomic control.

35. Describe the disorders of motility that can lead to gastroparesis, achalasia, diarrhea, constipation, megacolon

36. Describe the location and process of water and electrolyte absorption.

37. Compare and contrast the function of the stomach, duodenum, small and large bowel.

38. Describe gastrointestinal defense mechanisms and gut flora.

### **Week 7 and Week 8 Urinary System**

#### **LOBs covered during lectures:**

39. Describe the variety of kidney functions aiming at maintaining homeostasis.

40. Recognise the nephron as the functional unit of the kidney.

41. Describe the process of glomerular filtration, define the filtration Coefficient, and list the factors influencing its performance.

42. Describe renal adaptation and performance during exercise.
43. Describe the process of tubular reabsorption of sodium, glucose and amino acids
44. Outline factors influencing reabsorption including aldosterone and natriuretic peptide and describe osmotic diuresis.
45. Describe the role of sodium reabsorption in the passive reabsorption of chloride, water, and urea.
46. Describe the process of tubular secretion of hydrogen and its role in acid-base balance.
47. Describe potassium secretion and its control by aldosterone
48. Explain the role of long loops of Henle in establishing a vertical osmotic gradient by counter current multiplication.
49. Describe the role of vasopressin in controlling water reabsorption in the final tubular segments.
50. Explain the role of the vasa recta in preserving the vertical osmotic gradient by the counter-current exchange.
51. Explain how water reabsorption is only partially linked to water reabsorption.
52. Describe the multi-system implications of renal failure.
53. Describe the storage of urine in the urinary bladder and the process of micturition.

### **Week 9, Week 10, and Week 11 Male and Female Reproduction System**

#### **LOBs covered during lectures:**

54. Describe the function of the reproductive system
55. Describe the components of the reproductive system i.e., gonads, reproductive tract, accessory sex glands, in males and females.
56. Describe the reproductive cells and recognize that they contain a half set of chromosomes.
57. Describe gametogenesis and how it is accomplished by meiosis resulting in unique sperm and ova.
58. Describe the role of sex chromosomes in determining the sex of an individual.
59. Describe how sex differentiation along male or female lines depends on the presence or absence of masculinizing determinants.
60. Describe the scrotal location of the testes which provides a cooler location for spermatogenesis.
61. Describe the role of Leydig cells in secreting testosterone.
62. Describe the process of spermatogenesis and the association to Sertoli cells.
63. Describe the control of testosterone secretion and spermatogenesis by the LH and FSH secreted by the pituitary.

	<p>64. Describe the increase in GnRH and other events which occur at puberty.</p> <p>65. Describe the storage and concentrating function of sperm by the reproductive tract.</p> <p>66. Describe the function of the accessory sex glands in contributing the bulk of the seminal fluid.</p> <p>67. Describe the process of male erection and ejaculation.</p> <p>68. Describe the factors which influence the volume and sperm content of the ejaculate.</p> <p>69. Describe the female sexual cycle, and discuss the differences between species like dogs and cats.</p> <p>70. Form an overall view of the female hormonal and ovarian cycle.</p> <p>71. Describe the steps of gametogenesis during the female ovarian cycle.</p> <p>72. Describe the ovarian cycle in terms of alternating follicular and luteal phases and the changes in hormonal secretion controlling these phases.</p> <p>73. Describe the complex hormonal interactions which control the ovarian cycle.</p> <p>74. Describe the changes which occur in the uterus at different stages of the ovarian cycle.</p> <p>75. Describe the process of ovulation, fertilization, implantation and identify the role of trophoblastic enzymes in blastocyst implantation in the endometrium.</p> <p>76. Describe the role of the placenta in hormone secretion for the maintenance of pregnancy and in exchanges between fetal and maternal circulation</p> <p>77. Describe the response of maternal body systems to the increased demands of pregnancy.</p> <p>78. Describe changes during gestation in preparation for parturition.</p> <p>79. Describe the normal physiological changes that occur during labour</p> <p>80. Describe the positive feedback cycle which occurs to accomplish parturition.</p> <p>81. Outline the physiological changes in the foetus at first breath.</p> <p>82. Describe the structure of the mammary glands and outline the endocrine control of lactation.</p> <p><b>Week 12 Revision</b></p> <p><b>Revision</b></p>		
Prerequisites	Physiology I	Required	None
Course Content	<b>Topics covered in lectures:</b>		

- **INTEGUMENTARY SYSTEM:**

- Describe the role of the skin and appendages

- **ENDOCRINE SYSTEM:**

- Principles of neural and hormonal communication.
- Hormonal synthesis, secretion, signalling.
- Hormone secretion, degradation, the central endocrine glands
- Central Endocrine Glands (Hypothalamus, anterior/posterior pituitary/pineal glands).
- Hypothalamic-Anterior pituitary- target endocrine organ feedback loop
- Thyroid, Parathyroid, Hyperthyroidism, Hypothyroidism, Control of
- Control of Calcium and bone metabolism
- Thyroid. Normal function, hypothyroidism
- Pancreas and Control of Fuel Metabolism

- **GASTROINTESTINAL SYSTEM:**

- Digestive tract and accessory digestive organs, mouth, pharynx, oesophagus.
- Stomach, Gastric Secretion, Duodenum.
- Duodenum and pancreatic secretion.
- Liver, gall bladder, bile secretion.
- Small bowel and absorption.
- Large bowel and overview of motility of the Gastrointestinal Tract.
- Enteric nervous system and disorders of motility

- **RENAL SYSTEM:**

- Overview of kidney function and urine formation
- Glomerular filtration
- Reabsorption
- Kidney counter current and tubular secretion
- Bladder micturition

- **REPRODUCTIVE SYSTEM:**

- Introduction
- Male Reproductive Physiology & Sexual intercourse between males and females
- Female Reproductive Physiology I - Ovarian Cycle - Female Reproductive Physiology II - Uterine Cycle & Physiology of Pregnancy

	-Physiology of Parturition labour and puerperium					
Teaching Methodology	Lectures, small group tutorials and Physiology software simulations					
Bibliography	<b>Authors</b>	<b>Title</b>	<b>Edition</b>	<b>Publisher</b>	<b>Year</b>	<b>ISBN</b>
	Elaine N. Marieb and Katja N. Hoehn	Anatomy and Physiology	7th	Pearson	2019	978-0136447658
	William O. Reece	Dukes' Physiology of Domestic Animals	13th	Wiley-blackwell	2015	978-1118501399
	Reece, W.O., Rowe, E.W.	Functional Anatomy and Physiology of Domestic Animals	5th	Wiley-Blackwell	2017	978-1119270843
	Bradley G. Klein	Cunningham's Textbook of Veterinary Physiology	6th	Sauders	2019	978-0323553605
Assessment	Attendance= 10%, Course assignment=30%, Final written exam=60%					
Language	English					