COURSE DESCRIPTION

COURSE DETAILS

Title (of the course): **DIAGNÓSTICO POR LA IMAGEN**
Code: 101471
Degree/Master: **GRADO DE VETERINARIA** Year: 3
Name of the module to which it belongs: CIENCIAS CLÍNICAS Y SANIDAD ANIMAL
Field: PROPEDÉUTICA CLÍNICA Y DIAGNÓSTICO POR LA IMAGEN
Character: OBLIGATORIA Duration: FIRST TERM
ECTS Credits: 3.0 Classroom hours: 30
Face-to-face classroom percentage: 40.0% Study hours: 45
Online platform:

LECTURER INFORMATION

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PREREQUISITES AND RECOMMENDATIONS

Prerequisites established in the study plan

ONLY PRACTICAL SESSIONS OF THIS SUBJECT ARE CONDUCTED IN ENGLISH. THE THEORICAL PROGRAM IS ALL CONDUCTED IN SPANISH.

This subject can be optionally chosen by students according to "Plan para el fomento de plurilingüismo de la Universidad de Córdoba".
B1 (Preliminary English test) certificate is a requirement for students to do this subject.
General Pathology subject must be previously passed by students to attend Imaging diagnose subject.

Recommendations

Previous knowledge and skills about Physic, and Physiology are recommended.
Students should get enough knowledge and skills in systematic Anatomy and Neuroanatomy and Topographic Anatomy to better get the objectives of Imaging diagnose.

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INTENDED LEARNING OUTCOMES

CU1	Proving the ability to use and master a foreign language.
CU2	Improving user-level skills in ICT
CU3	Encouraging an active job search and the ability to become an entrepreneur
CT1	Problem solving.
CT2	Teamwork.
CT3	Ability to put knowledge into practice
CT4	Decision making.
CT5	Ethical responsibility.
CT6	Analysis and synthesis skills.
CT7	Research skills.
CT8	Quality incentives.
CE28	Diagnosis by image and by radiobiology.

OBJECTIVES

General objectives:
- To know about the nature and properties of the ionizing radiation, mainly related to the X-rays.
- To Know about legislation and safety procedures using radiation.
- To Know about the different imaging diagnosis techniques (x-ray, ultrasonography, computed tomography, magnetic resonance).
- To differentiate normal versus pathological images obtained using x-rays, ultrasonography and computed tomography in pets.

Objectives according to the OIE document:
3b: Usage of diagnostic and therapeutic tools to control the most frequent zoonosis and the diseases caused by food.
8a: Explaining of the animal wellfare and the responsabilities associated to the owner, workers, veterinary clinician and people in charge of taking care of animals.
9a/b: Getting knowledge about the general legislation and the specific laws for the veterinary function.
11a/b: Getting skills to communicate and exchange technical information with the media and among veterinary mates.

CONTENT

1. Theory contents

Theory contents

RADIOLOGY.

Chapter 1.-Imaging diagnosis techniques. X ray generation. Electromagnetic waves. Excitating and ionizing. Electron interaction with matter. Collision types. Stopping power. X ray spectrum. Radiology, radiography, radiodiagnose and radiotherapy concepts.

Chapter 2.-X ray interaction with matter. Interaction types. Photoelectic effect. Compton effect. Formation of the radiological image related to the interaction.

Chapter 3.-X ray equipments and accesories. Radiographic scanners and image processing. Conventional radiology. Computed radiology (CR), direct digital radiology (DDR). Digital terminology: DICOM, PACS.

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Chapter 4.-Radiography quality. Exposure factors: kilovoltage, milliamperage, time and distance controls. Factors of radiography quality: density, contrast, detail, subject contrast.
Chapter 5.-Ionizing radiation regulations. Principles of radiation protection. Concepts and Objectives. Measurement units. ALARA criteria. Dosimetry.
Chapter 6.-Radiology in small animals (I). General principles. Terminology. Head and vertebral column radiographies: positioning and techniques. Contrast radiography. Normal and pathological images.
Chapter 7.-Radiology in small animals (II). Appendicular skeleton radiography: positioning and techniques. Normal and pathological images.
Chapter 8.-Radiology in small animals (III). Neck and thorax radiographies: positioning and techniques. Contrast radiography. Fluoroscopy. Normal and pathological images.
Chapter 9.-Radiology in small animals (IV). Abdomen radiography: positioning and techniques. Contrast radiography. Normal and pathological images.
Chapter 10.-Radiology in small animals (V). Contrast radiography. Types of contrast agents. Advantages and disadvantages. Contrast agents and techniques specific for each anatomical region.
Chapter 11.-Equine radiology (I). General principles. Terminology. Forelimb radiography. Positioning and techniques. Normal and pathological images.
Chapter 12.-Equine radiology (II). Hindlimb radiography. Positioning and techniques. Normal and pathological images.
Chapter 13.-Equine radiology (III). Head, vertebral column, thorax and abdomen radiographies. Positioning and techniques. Normal and pathological images.

ULTRASONOGRAPHY.
Chapter 14.-General principles of ultrasonography. Terminology. Techniques and interpretation of ultrasonography images. Artefacts. Indications.
Chapter 15.-Techniques and interpretation of ultrasonography images of the thorax in small animals.
Chapter 16.-Techniques and interpretation of ultrasonography images of the abdomen in small animals (I). Digestive system, liver, spleen, adrenal glands and panchreas. Ultrasonographical diagnosis of the main pathologies.
Chapter 17.-Techniques and interpretation of ultrasonography images of the abdomen in small animals (II). Kidney, urinary system, genital system and peritoneum. Ultrasonographical diagnosis of the main pathologies.
CT
Chapter 18.- General principles and indications of the computed tomography (CT) in small animals.

Chapter 19.-Imaging diagnosis in exotic animals. Positioning and Techniques.

Searching lines:
. Imaging diagnose (Professor Novales): Assessment of the pathologies of the domestic and exotic animals using radiology, and computed tomography surveys. Updating the teaching of the advanced imaging diagnose techniques. Radiological and CT study about horses' teeth.
. Digestive diseases in small animals (Professor Lucena): Updating diseases of digestive tube, liver and exocrine panchreas in small animals and their differential diagnose using Rx, ultrasonography and CT techniques. Clinical cases about digestive pathologies diagnosed using imaging diagnose, biopathological results and endoscopic exploration.
. Updating ultrasound studies in small animals (Prof. Profa. B. Blanco y Prof. Hernández).
. Updating and assessment of horses pathologies by Rx and ultrasound exploration (Prof. Hernández).

2. Practical contents

PRACTICAL SESSIONS ABOUT RADIOLOGY (SMALL GROUPS).
Session 1.-Procedure for working in a radiology room in the veterinary practice. Safety spaces and legislation. X ray equipment and accesories. Radiology in small animals. Clinical cases.
Session 2.- Radiology in small animals. Clinical cases.

COURSE DESCRIPTION

Session 3. - Radiology in horses. Clinical cases.

. PRACTICAL SESSIONS ABOUT ULTRASONOGRAPHY (SMALL GROUPS).
Session 4. Ultrasonography. Management, adjustment and selection of transducers in small animal ultrasonography. Abdominal ultrasonography in small animals.
Session 5.-Ecocardiography in small animals.
Session 6.- Ecography in tendons of horses.
Session 7. Emergency Ecography in small animals.

CLINICAL SEMINARS (SMALL GROUPS).
Seminar 1.-Radiological interpretation of pathological images in small animals.
Seminar 2.-Ultrasonographical interpretation of pathological images in small animals.
Seminar 3.- Oral exposition of the works made by students about reports from Veterinary Radiology and Ultrasound Journal

CLINICAL SEMINAR (MEDIUM GROUPS)
Seminar 4. Radiology and TC studies in small animals.

SUSTAINABLE DEVELOPMENT GOALS RELATED TO THE CONTENT

Unrelated

METHODOLOGY

General clarifications on the methodology (optional)

- Students have to attend 90% out of the practical programme to do the final exam of the subject.
- It is compulsory for all students, also repeater ones, to study and perform an oral presentation of a topic related to the subject of imaging diagnose, choosen from the Veterinary radiology and ultrasound journal. Students can be grouped in 4 students per group for the realization of this work.
-The final mark of the practical programme represented the summatory of the marks obtained by students in each practical and seminar sessions (10 sessions in total) plus the obtained mark in the presentation of the work from the journal.
- It is optional for repeater students to attend the practical programme (ten practical and seminar sesions). It is only mandatory for them to do the work about a topic in Veterinary Radiology and Ultrasound journal.
- Repeater students not attending again the practical programme will be evaluated with a 50% of the maximun mark that can be obtained in the 10 sessions plus the mark obtained in the exposition of the work.
- If repeater students wanted to repeat the whole practical programme, the final mark obtained will be calculated the same way than the remaining students.
- Practical sessions and seminars will be evaluated at the end of each session.
. Tutorings will be done on-site or online through the foro or chat in moodle or by using the email correspondence, in the best time for both students and professors.

Methodological adaptations for part-time students and students with disabilities and special educational needs

Special factors in part-time students and students with disabilities or with special educational needs will be taken into account.

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Face-to-face activities

Activity	Large group	Medium group	Small group	Total
Clinical practice	-	-	10	10
Group presentation	-	-	1	1
Lectures	15	-	-	15
Seminar	-	1	3	4
Total hours:	***15***	***1***	***14***	***30***

Off-site activities

Activity	Total
Group work	6
Information search	5
Reference search	4
Self-study	30
Total hours	***45***

WORK MATERIALS FOR STUDENTS

Case studies
Coursebook
Lessons summary
Oral presentations
References

EVALUATION

Intended learning	Case Studies	Case study/clinical case discussion/scientific work discussion	Exams
CE28	X	X	X
CT1		X	
CT2		X	
CT3		X	
CT4	X	X	X
CT5	X		X

COURSE DESCRIPTION

Intended learning	Case Studies	Case study/clinical case discussion/scientific work discussion	Exams
CT6	X	X	X
CT7		X	
CT8	X		X
CU1	X		X
CU2	X		X
CU3	X		X
Total (100%)	***30%***	***10%***	***60%***
Minimum grade	***5***	***5***	***5***

(*)Minimum mark (out of 10) needed for the assessment tool to be weighted in the course final mark. In any case, final mark must be 5,0 or higher to pass the course.

Method of assessment of attendance:

It is compulsory for all the students to attend 90% of the practical program to be allowed to do the final exam of the subject.

General clarifications on instruments for evaluation:

. The final exam of the course is divided in two exams. The theorical exam and the practical exam. The theorical exam consists of a multiple choice test about the topics of the subject. In the practical exam, several slides about radiographic, ultrasonographic and CT images of both small animals and horses will be shown to students for their interpretation and diagnosis. Both, the theorical and the practical exam will be performed at the same time in the date established in the oficial calendar of Veterinary Degree. Students must stay at the examination room until both exams are concluded. All students, even repeater ones, must do both the theorical and practical exams in all the oficial calls.

. Evaluation instruments "exam and case studies": marks got by students in the theorical and practical exams, respectively, are included in these evaluation instruments.

- Evaluation instrument "case study/clinical case discussion". In this instrument , the mark got by students in the study and exposition of the work of the journal Veterinary Radiology and Ultrasound is included and also the marks got by students in each practical sessions and seminars.

- MARKS GOT BY STUDENTS IN THE CASE STUDY/CLINICAL CASE DISCUSSION EVALUATION INSTRUMENT WILL NOT BE CONSIDERED IN THE FINAL QUALIFICATION UNLESS THE STUDENT HAD GOT 5 POINTS IN BOTH THE THEORICAL AND PRACTICAL EXAM OF THE SUBJECT.

- Marks got by students in the case study/clinical case discussion evaluation instrument will be added to the final qualification only in the oficial calls during the course 23-24. These marks will not be considered in the following courses.

COURSE DESCRIPTION

Clarifications on the methodology for part-time students and students with disabilities and special educational needs:

Special conditions will be considered in part-time students or students with any kind of disability or educational needs.

Clarifications on the evaluation of the extraordinary call and extra-ordinary call for completion studies:

Evaluation method for students of the first extraordinary and extra-ordinary calls will depend on the number of the students attending these calls.

Qualifying criteria for obtaining honors:

Mark equal or higher to 9.5 points.

BIBLIOGRAPHY

1. Basic Bibliography

. AGUT GIMENEZ A y SANCHEZ VALVERDE MA (1992). Radiodiagnóstico de pequeños animales. InteramericanaMcGraw-Hill. Madrid.

. BARR F AND GASCHEN L (2012) BSAVA. Manual of canine and feline ultrasonography. British small animal veterinary association. Gloucester, England.

. BARR F AND KIRBERGER R (2006). BSAVA Manual of canine and feline musculoskeletal imaging. British small animal veterinary association. Gloucester, England.

. CAPELLO V. AND LENNOX A.M. (2008). Clinical radiology of exotic companion mammals. Iowa: Wiley-Blackwell.

. FARROW CHS. (2005). Diagnóstico por imagen del perro y el gato. Multimédica Ediciones Veterinarias. Barcelona.

. LAMB, CR. (1995). Diagnostic par l'image du chien et du chat. Ed. Maloine. París.

. MANTIS, P. (2016). Ecografía práctica en pequeños animales. Abdomen. Servet grupo Asis-Biomedia SL. Zaragoza.

. MARTINEZ HERNANDEZ M (1992). Radiología Veterinaria en Pequeños Animales. Interamericana-McGraw-Hill. Madrid.

. MIRÓ, F Y COLS. Atlas de anatomía topográfica y tomografía computerizada de la cabeza del perro. Proyecto de innovación docente de la Facultad de veterinaria de Córdoba FV-IN17, convocatoria 2010-2011.

. MORGAN JP, NEVES J and BAKER T (1991). Equine Radiography. Iowa State University Press. California .

. MORGAN JP, SILVERMAN S et ZONTINE WJ (1981). Techniques en Radiologie Vétérinaire. Le Point Vétérinaire. 1 Maison-Alfort. Francia.

. NOVALES M, MIRÓ F, MARTÍNEZ-GALISTEO A. Anatomía radiográfica del caballo. Colección de 3 videos. Edic. Don Folio. Córdoba, 2002.

. NOVALES M (2004). Diagnóstico radiológico en el caballo. Menudillo y dedo. Editorial Almuzara. Córdoba.

. NYLAN TG, MATTOON JS. (2002). Small animal diagnostic ultrasound. 2nd ed. WB Saunders. Philadelphia, USA.

. O'BRIEN R. AND BARR F. (2009). BSAVA Manual of canine and feline abdominal imaging. Ed Bristish Small Animal Veterinary Association. Gloucester, England.

. ROLDÁN ROMERO, J; VÁZQUEZ BRINGAS, FJ; MÉNDEZ ANGULO JL. (2020). Valoración de los hallazgos radiográficos del modelo de precompra de AVEE. Ed. Servet. ISBN 978-84-09-20292-8.

. SAMOUR JH, NALDO JL. (2007). Anatomical and clinical radiology of birds of prey. Including interactive advanced anatomical imaging. Philadelphia: Saunders Elsevier.

. SCHWARZ T and SAUNDERS J. Veterinary Computed Tomography. Willey-Blackwell. Oxford. 2011.

. SHORES A. (1993). Diagnostic Imaging. The Veterinary Clinics Of North America (Small Animal Practice), 23.

. SMITH SA and SMITH BJ. Atlas of avian radiographic anatomy. Philadelphia: Saunders WB. 1992.

. TANARRO SANZ A. (1986) Radiaciones Ionizantes. Instalaciones Radiactivas y de Rayos X. Publicaciones

COURSE DESCRIPTION

Científicas de la Junta de Energía Nuclear. Madrid.
. THRALL DE. Manual de diagnóstico radiológico. 4ª edición. Elsevier 2003.
. TICER J.W. (1984). Radiographic Technique in Veterinary Practice. 2nd Ed. Saunders Wb. Philadelphia.
JOURNALS.
. Veterinary Radiology and Ultrasound (versión electrónica o impresa).

2. Further reading

. Páginas web:
-www.csn.es -www.acvr.org
-www.vet.gla.ac.uk/evdi/ecvdi.htm
-www.uco.es/empresa/hcv
-www.vet.gal.ac.uk/evdi/eavdi.htm
-www.acvr.org/general/related_sites/ivra/index.htm

COORDINATION CRITERIA

Tasks performance

Clarifications

Evaluation criteria are decided among all the professors in charge of the subject. Theorical lectures are coordinated with the practical programme by all the professors. Besides, the presentation and exposition of the work from the journal are also established at the final phase of the programme of the subject.
Professors in charge of this subject are coordinated with other related subjects. Also, in an upper level, this subject is coordinated with others from the Department of animal medicine and surgery.
The coordination will be performed periodically by meetings to improve the subject development.
Finally, all the courses of the Veterinary Grade will be coordinated by the Faculty conceil members.

SCHEDULE

Period	Clinical practice	Group presentation	Lectures	Seminar
1# Week	0,0	0,0	2,0	0,0
2# Week	2,0	0,0	2,0	0,0
3# Week	0,0	0,0	2,0	0,0
4# Week	0,0	0,0	2,0	0,0
5# Week	2,0	0,0	2,0	0,0
6# Week	0,0	0,0	2,0	1,5
7# Week	0,0	0,0	2,0	0,0
8# Week	2,0	0,0	1,0	0,0
9# Week	0,0	0,0	0,0	1,5
11# Week	2,0	0,0	0,0	0,0

COURSE DESCRIPTION

Period	Clinical practice	Group presentation	Lectures	Seminar
12# Week	0,0	0,0	0,0	1,0
13# Week	0,0	0,5	0,0	0,0
14# Week	2,0	0,5	0,0	0,0
Total hours:	***10,0***	***1,0***	***15,0***	***4,0***

The methodological strategies and the evaluation system contemplated in this Course Description will be adapted according to the needs presented by students with disabilities and special educational needs in the cases that are required.