BUASVM Timisoara
Faculty of Veterinary Medicine Timisoara

COURSE DESCRIPTION
PHARMACOLOGY

1. Data on the programme

1.1 Higher Education Institution	University of Agricultural Sciences and Veterinary Medicine of Banat "King Michael I of Romania" from Timisoara
1.2 Faculty	Veterinary Medicine
1.3 Department	III / Clinic education II
1.4 Field of study	Veterinary Medicine
1.5 Cycle of study	Licence
1.6 Study programme/Specialisation	Veterinary Medicine

2. Data on the discipline

2.1 Name of the discipline			**Pharmacology**				
2.2 Course leader			**Prof. Romeo Teodor CRISTINA, DVM, PhD.**				
2.3 Seminar leader			**Prof. Romeo Teodor CRISTINA, DVM, PhD.**				
2.4 Year	**III**	2.5 Semester	V and VI	2.6 Evaluation type	**E**	2.7 Regime of discipline	**OF**
2.3 Code of the discipline			**MVE.III.02.1.O.F / MVE.III.08.2.O.F**				

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	**Sem. I. 4** **Sem. II 4**	Of which: 3.2 course	**2** **2**	3.3 seminar / laboratory / project	**2** **2**
3.4 Total hours in the curriculum	**112**	Of which: 3.5 course	**56**	3.6 seminar / laboratory / project	**56**
Distribution of the time available					hours
Individual study (manual, course support, bibliography, course notes)					**20**
Supplementary documentation in the library, on electronic platforms and in the field					**6**
Preparation for seminars / laboratories, housework, reports, portfolios, and essays					**6**
Other activities:					**1**

3.7. Total number of hours of individual study	**20 + 6 + 6 + 1= 32**
3.8. Total hours per semester	**112 + 33 = 145**
3.9. Number of credits	**5 + 4 = 9**

4. Preconditions (if the case)

4.1 curriculum	The previous learned curriculum subjects; generally all disciplines and especially the fundamental preclinical disciplines: Histology - Embryology, Physiology and Pathophysiology, Biochemistry, Semiology, Microbiology.
4.2 competencies	Knowledge of: • physiological and pathophysiological main mechanisms and the organ systems • phases of animal metabolism and enzymes activity • the structure and main functions of cell and tissue • microorganisms main activity.

5. Conditions (if the case)

5.1. for the course to be given	• modern active learning and interactive teaching conducted with heuristic spirit, and with actual topic's problematic posing; • lecture room / amphitheatre, modern ways education (PC, projector), teaching material: Power Point presentation, didactic clips, specialized journal(s) etc. to discipline.
5.2. for the seminar/laboratory to be managed	• Rules of conduct for students in the laboratory of Pharmacology. • Terms of learning practical approach in mind heuristic problematical; laboratory, seminar room, laboratory facilities specific materials for Pharmacology hours.

6. Specific competencies

Professional competencies	In consonance with the requirements of other EU recognised Curricula for the veterinary pharmacology, this discipline focuses on students skills developing related to the knowledge of basic criteria for: drug effectiveness determining (pharmacokinetic and pharmacodynamic features), groups of drugs toxicity, drug incompatibilities and/or side and adverse effects, validity and preservation of veterinary medicinals. Based on knowledge of ATC classification of the A.U.V. drugs is followed: the knowledge of them activity / action, the characteristics, the possible associations, their withdrawal period / prohibition, the knowledge of the drug resistance sources, knowledge of drug residue and maximum admitted daily dose concepts etc., also are expected skills to implement the most appropriate therapeutic schemes in rent animals and pets and in treatments individualisation. All these competences will be filled with learning and using basic concepts in calculating drug doses and concentrations as well as correct and responsible prescribing of the most appropriate medicines in animals, individualizing the treatment cases or per groups of animals, and also the knowledge of OTC-over the counter and Extra Label notions and their application in **Vet-Client-Patient** (VCP) relationship and main EU directives on veterinary drug) is expected.
Transversal competencies	Ability to design and present simple projects in veterinary pharmacology. The applying of simple techniques for an efficient work, in multidisciplinary teams with pharmacologists included on various hierarchical levels (with potential beneficiaries). Ability to documentation in Romanian language and at least in one foreign language, to identify new knowledge and developments in veterinary pharmacology, future professional and personal development purposes by training up to date and in continuous education systems (LLL).

7. Objectives of the discipline (as pointed to by the specific competencies)

7.1. General objectives	The principle aim of teaching pharmacology to veterinary students is to provide them with a satisfactory understanding of the pharmacodynamic and pharmacokinetic principles which determine rational and safe selection of a therapeutic agent and the appropriate/efficient use in current clinical veterinary practice. The study of this discipline in third year of the scholarship, make the most natural transition to the clinical disciplines group, **Pharmacology being considered as a turn-table discipline that can be considered fundamental to them.** Pharmacology is harnessing useful concepts from the first two years of veterinary education and making all the logical connections, accurate and efficient for the benefit of the next following of the clinical group disciplines.
7.2. Specific objectives	It is envisaged the students preparation for an effective and competent activity which is completed with compulsory skills in terms of: knowledge, the judicious selection and application of the best drug therapy (chosen from a growing group of pharmaceutical substances and conditionings), knowledge and understanding of phenomena that occurs with the active substance administration in the animal body: kinetics, dynamics, remanence / accumulation and their possible hazardous potential in the body; the treatments consecutive healing status and the ability to intervene timely with treatment in various clinical situations (acute or chronic). This challenge is achieved by teaching the **general pharmacology (or bases of pharmacology)** in Semester I (where are studied in detail: pharmacokinetics and pharmacodynamics of the drugs and accumulating information about the invasion and / or evasion stage of the medicines: routes of administration and absorption, coupling to plasma proteins, distribution, metabolism, elimination, and the theoretical and practical aspects of the veterinary therapeutics, pharmacovigilance, euthanasia and the **special pharmacology (the main therapeutic groups)**, where student accumulates essentials about: drugs classification, the major A.U.V. groups, drugs with specific therapeutic recommendations preparation, spectrum, associations, waiting periods, kinetic action, drug incompatibilities, adverse/secondary effects, resistance phenomena, etc.)

8. Contents Sem. I and Sem. II / III-rd. year VM

8.1. Course **Semester I – Bases of Pharmacology (Drug's Invasion / Evasion)**	Number of hours	Observations
Topic no. 1. Introduction in Pharmacology. History and evolution of Pharmacology. Pharmacology branches. Notions of: medicine - food - toxic, drug, remedy, medication etc. Pharmacopoeia.	**2**	

Achievements and directions in foreign and domestic drug industry. Research of the new active substances.		
Topic no. 2. Routes of administration & the body drugs' absorption. Organism - environment processes. Administration routes: the oral, respiratory, cutaneous, intravenous, intramuscular, subcutaneous, rectal administration, vaginal and intra-mammary way. etc.	**2**	
Topic no. 3. Drugs' transport in the blood. Factors influencing the drugs transport (structure, fixing for transport, albumins, globulins, lipoproteins). Drugs' diffusion. The hystomorphological characteristics. Physical-chemical factors involved in the distribution. Coupling to the proteins. Diffusion in the body's fluid spaces. The correlation between pH, pKa and drug diffusion.	**2**	
Topic no. 4. Drug distribution in the tissues. About the distribution mechanisms. Passage through the barriers: blood-brain, haemato-optalmic, placenta, skin, etc.). Drugs redistribution. The consequences of the drugs' unequal distribution in the body.	**2**	
Topic no. 5. Drugs fixing on receptors. Activity and the receptors' characterization. Mode of action and nature of the receptors. Isolation and identification of the receptors. Agonists. Antagonists. Secondary messengers.	**2**	
Topic no. 6. Quantifying the coupling response – The main receptor theories: *Clark's theory, Ariens' theory, Stephenson's theory, Paton's theory, Activation theory', Enzymology theories*.	**2**	
Topic no. 7. Drug metabolism - Main factors influencing the metabolism. *Physiological factors*: the renal blood flow, urinary pH, protein binding, and enzymes). *Factors related to the animal:* species, individuality, age, sex, pregnancy, nutrition, health, genetic factors). *Exogenous factors*: circadian rhythm, chemical compounds, exogenous stressors.	**2**	
Topic no. 8. Drug biotransformation. The main metabolic reactions: microsomal, non-microsomal, biotransformation under the action of the digestive microflora, drug conjugation, acetylation, methylation, sulphono-conjugation, glucuronidation, peptide-conjugation, mercaptation.	**2**	
Topic no. 9. Drugs elimination and their accumulation in the body. The elimination ways: renal, digestive, biliary, respiratory, skin, mammary, egg.	**2**	
Topic no. 10. Elements of pharmaco-kinetics. The pharmacokinetic models: one compartmented, two compartmented, three compartmented. The Bateman's function.	**2**	
Topic no. 11. Factors influencing the drugs effect. *The main factors:* species, age, individual characteristics, type of nervous activity, patho-medical condition, route of administration, dosage form. *The influence of the therapeutic effect by the drug. Main factors which determine the dosages. Concomitant drug therapy. Factors determining the administrations' frequency Stereo specificity of the drug action.* The "*zero-order kinetics*". *The drug residues. The risk - benefit ratio.*	**2**	
Topic no. 12. Changes in the organism under the drugs influence. The general and local action. The direct, indirect, reflex, main, secondary, ethyotrope and symptomatic therapy. Correlation between the chemical structure and the pharmacodynamic activity.	**2**	
Topic no. 13. Dose-effect relationship. *Latency and intensity. Duration of the pharmacons action. Biopharmaceutical factors and therapeutic effect. Statistical methods commonly used and about pharmacometry.*	**2**	
Topic no. 14. Drug combinations. Phenomena observed following repeated administration or combination of the veterinary drugs: accumulation, habituation, synergism, potentiation, antagonism. Antidotism. Side effects (undesirable). The therapeutic or toxic activity of the drugs at the time and site of administration. The incompatibilities.	**2**	
Total	**28**	
Semester II – The Special Pharmacology (main therapeutic groups)	Number of hours	Observations
Topic no. 1. Antiseptic and disinfectant substances.	**2**	

Introduction. The A & D classes. Mode of action, indications and contraindications. Conditions that favour or hinder the action of disinfectants. Common uses in veterinary medicine. *Disinfectants and antiseptics unstable oxidizers*: compounds of chlorine, iodine and derivatives, hydrogen peroxide and hydrogen peroxide, potassium permanganate, etc.) and the *reducing ones* (formaldehyde compounds, urothropine etc.). *Stable disinfectants and antiseptics: the acids* (mode of action, features, presenting the most important acids), *bases* (mode of action, features, presenting the most important bases), *the salts of heavy metals* (mode of action, features, presenting the most important veterinary products in this group), *the surfactants* (mode of action, soaps, anionic, cationic, non-ionic), *the organics* (mode of action, alcohol derivatives, iodophorm and succedaneum, phenols, cresols, naphthalene, etc, and tars). Description of specific conditionings.		
Topic no. 2. Synthetic chemotherapeutic substances. Introduction. Mode of action. The main groups' description: arsenics, antimony, bismuth, benzidines, quinoleins, oxyquinoleins, triphenylmethanes, thiazides, quinaldines, furans and diverse representatives. Description of specific conditionings.	**2**	
Topic no. 3. Sulphonamides. Introduction. Classification. The main physical-chemical properties. The antimicrobial spectrum. Mode and mechanisms of action. *Potentiated sulphonamides*. Resistance phenomenon. Absorption. Diffusion. Metabolism. Elimination. Secondary effects. Indications and contraindications. Directions of use and dosage. *Sulphonamides with general* and *local action*. *Long acting sulphonamides*. *Associations* between them and potentiated sulphonamides. Diaminopyrimidines. Description of specific conditionings.	**2**	
Topic no. 4. Antibiotics. Introduction. Origins. Definitions. Classification. The antimicrobial spectrum. Mode and mechanism of action. The antibiotic resistance. The side effects and toxicity. Pharmacokinetics. The use of antibiotics in therapy. Dosage. Antibacterial antibiotic groups: *beta-lactams* (penicillins extraction semi-synthetic cephalosporins). *Oligosaccharides*, *antibiotic macrolides, cyclic polypeptides, synergistins, tetracyclines, chloramphenicol, various antibiotics. Antifungal therapy* (systemic and external). *Antivirals. Antiprotozoals. Cytostatics. Phytoncides and zooncides* etc. Product description used in practice. *The non-specific stimulant therapy*: description of the specific conditionings.	**3**	
Topic no. 5. Antiparasitic substances. Introduction. Origins. Classification. Mode and mechanism of action. The induction of the anthelmintics. Toxicity. Side effects. Indications and contraindications. Dosages. *Internal antparasitics*: Anthelmintics acting on nematodes (old groups) benzimidazolic group (BZ) methyl-carbamates-BZ, BZ-halogenated, pro-benzimidazoles). Derivatives of: imidazothyazoles, tetra-hydropyrimidines, pyridines, organophosphoric compounds. *Antiparasitic macrolids.* Other nematodicide active substances. *Antparasitic Delivery Systems. Drugs used against cestodes and trematodes*: old products derivatives: salicylanilides brome- salicylanilides, tiodiphenols, nitrophenols, organophosphates, carbamates, etc. *Other derivatives. Anticoccidal substances.* Description of specific conditionings. *External antiparasitics.* The nature of mineral, vegetable and synthetic. *Contact insecticides* (pyrethrins and pyrethroids, triazopentadienes). Description of the specific conditionings.	**3**	
Topic no. 6. Substances acting on Central Nervous System. Introduction. *CNS depressants:* action, pharmacokynetics, pharmacodynamics, indications, contra-indications. *Narcotic gases*, volatile and fixed. *Hypnotics* (barbiturates, magnesium derivatives). *Analgesic substances* (opiates and other alkaloids, isoquinoleins, synthetic products). *Antipyretic substances* (pyrazolones derivatives, salicylic anilines, quinoleins). *Local anaesthetics* (cocaine succedaneum). Description of the specific conditionings. *CNS stimulants* mode of action, indications, pharmacodynamics (caffeine, camphor, pentetrazole, nicetamides, strychnine). Description of specific conditionings.	**2**	
Topic no. 7. Substances acting on the Autonomous System. Introduction. Classification and description. Mode of action, pharmacodynamics,	**2**	

indications and contraindications. *Parasympathomymetics* (choline-reactive muscarinic systems, reactive systems nicotin-choline) (acetylcholine, vasoperif, pilocarpine, ezerine, myostin, arecoline). *Parasympatholythics* (atropine, tropicamide, cyclopentoate, scobutyl). *Sympathomymethics* (norepinephrine, naphozaline, phenilephrine, asmopent, isoprenaline, bamethane, adrenaline sympathol, amphetamine, ephedrine). *Sympatholythics* (guanethidine, clonidine, methyldopa, *Claviceps* & ergometrine, tolazoline, yohimbine). Description of specific conditionings.		
Topic no. 8. Antihistaminic substances. Histamine and antihistaminic activity. Main antihistaminic representatives: promethazine, phenyramine, halopyramine, pyribenzamine. Description of specific conditionings. *Ganglioplegic substances* (nicotine, parcetine, lobeline, sparteine, cytisine, hexamethonium, thrymetaphane, tetraethylamonium iodide). Description of specific conditionings.	**1**	
Topic no. 9. Substances acting on the digestive tract. Introduction. Description of action mode, indications and contraindications, pharmacokinetics. Classification. *Eupeptic substances* (hydrochloric acid, pepsin, trypsine, pancreatine, bromulyne, papain, amylase). *Digestives*: bitter, aromatic, saline diverse. *Ruminatory substances. Emetics. Ant emetics. Herbal products*, and combinations frequently used. *Acting on central and/or peripheral reflex. Laxatives and purgatives* (oily, salt base, of the large intestine, various). *Diarrheal medication* (sedatives, antispasmodics, protective, mucilaginous, adsorbent, antiseptic). *Carminatives, Anti-fermentescibles and foaming agents*. Description of specific conditionings.	**2**	
Topic no. 10. Substances acting on the respiratory system. Introduction. Mode of action, indications and contraindications pharmaco kinetics. Classification of groups. *Respiratory centre stimulator. Bechic substances. Expectorants.* Specific mechanisms. *Bronchodilators. Fluidificants*. Excretomotors. Antsecretory Description of specific conditionings.	**1.5**	
Topic no. 11. Substances acting on the cardiovascular system. Introduction. Mode of action, therapeutic indications and contraindications. Groups of: *Cardiovascular medication*. A systolic medication. *Cardiovascular analeptics*. *Vasoconstrictors and vasodilators substances*. *Haemostatics. Anticoagulants and plasma substitutes*. Description of specific conditionings.	**2**	
Topic no. 12. Substances acting on urinary system. Introduction. *Diuretics* (purines, mercurial sulphonamides, vegetal source). *Adrenal and non-adrenal substances*. *Ant diuretics. Urinary antiseptics*. Description of specific conditionings.	**1.5**	
Topic no. 13. Substances acting on metabolic processes. Introduction. Mode of action, indications and contraindications kinetics. Classification of groups. *Nutrient analeptics. Plastics and Roburants* (iron and its derivatives, derivatives of calcium, phosphorus and derivatives). *Feed stimulators additives and enzymes*. *Water and fat-soluble vitamins*. Therapeutic indications. Description of most used conditionings.	**2**	
Topic no. 14. Hormones. Introduction. *Androgens* (testosterone based). *Oestrogens* (oestradiol and synthetic products). *Progestagaenic* (natural and synthetic). *Prostaglandins. Uterine and mammary gland medication. Pituitary preparations* (ante-hypophysary and post-hypophysary representatives). *Suprarenalienes. Ant diabetics. Thyreostatics. Parathiroidienes. Other endocrine substances* (endorphins, interferons, somatomedins). Indications and contraindications. Commercial preparations description.	**2**	
Total	**28**	
8. 2. LABORATORY / PRACTICAL WORKS **Semester – I.**	Number of hours	Observations
Topic no. 1. Introduction. Presentation of the Pharmacology laboratory. Romanian Pharmacopoeia, European Ph. and US Pharmacopoeia. The veterinary medicinal products, the classes of conditioning, EU legislation related to the testing of the new drug classes.	**2**	Frontal activity with student groups, or individual with materials and teaching aids using: PPT
Topic no. 2. Usual calculations in pharmacology. Calculation of the drug's dose and concentration	**2**	

Topic no. 3. Usual calculations in pharmacology. Calculation of the solvent reduction or multiplication	**2**	Examples of calculation and types of prescriptions.
Topic no. 4. Usual calculations in pharmacology. Calculation of dilutions, of micro quantities and of drug's concentration in the blood and body.	**2**	
Topic no. 5. Usual calculations in pharmacology. Calculations of dose extrapolation from human medicine drugs to veterinary medicine after the Lowe and Losher formulas (after the metabolic weight and after body surface area).	**2**	
Topic no. 6. Pharmacography. Purpose and importance of the study. The wording of the medical recipe, about the receipt. Common used abbreviations.	**2**	
Topic no. 7. Pharmacography. The components of the recipe: *Inscriptio, Invocatio, Designatio materiarum*.	**2**	
Topic no. 8. Pharmacography. The components of the recipe: *Subscriptio, et nomen aegroti Signatura, Nomen medici*	**2**	
Topic no. 9. Pharmacography. Prescription with hard stamp (special recipe). Files preparation. The prescriptions in the EU and USA. Categories and examples of recipes to groups of diseases.	**2**	
Topic no. 10. Incompatibilities. The physical, chemical and pharmacological incompatibilities.	**2**	
Topic no. 11. Drug interactions. The pharmacokinetic and pharmacodynamic ones.	**2**	
Topic no. 12. Drug combinations. Synergistic, indifferent and antagonistic drug associations.	**2**	
Topic no. 13. Adverse reactions to drugs. Type toxic, idiosyncratic, drug allergy, mutagenic, teratogenic, carcinogenic, tolerance and dependence to veterinary drugs.	**2**	
Topic no. 14. Practical works exam	**2**	
Total	**28**	
Semester - II.		
Topic no. 1. Antiseptics and disinfectants. (Unstable and oxidising disinfectants. Reducing agents. Topical substances).	**2**	
Topic no. 2. Antiseptics and disinfectants. (Stable disinfectants (acids, alkali, soaps and detergents, salts of heavy metals). Organic A & D.	**2**	
Topic no. 3. Chemotherapeutics.	**2**	
Topic no. 4. Sulphonamides.	**2**	
Topic no. 5. Antibiotics.	**2**	
Topic no. 6. Internal and external antparasitics.	**2**	
Topic no. 7. CNS Narcotics, anaesthetics and excitatory substances	**2**	
Topic no. 8. Substances acting on ANS and Antihistamines	**2**	
Topic no. 9. Medication of digestive tract	**2**	
Topic no. 10. Medication of cardio-vascular tract,	**2**	
Topic no. 11. Medication of urinary tract	**2**	
Topic no. 12. Medication of skin and mucosa	**2**	
Topic no. 13. Vitamins and hormones	**2**	
Topic no. 14. Practical works exam	**2**	
Total	**28**	

Bibliography

Nr. crt.	Title	Author(s)	Editor / apparition year
Own materials			
To this discipline is accepted any other Pharmacology course material appeared in the last ten years who is respecting the above ***Pharmacology curricula***			
An important tool to the students' disposition is the site of Pharmacology discipline: http//www.veterinarypharmacon.com. The students can visit freely the website ant the online courses			
Discipline has its own publication. Issues of Journal ***Medicamentul Veterinar / Veterinary drug*** 1843-9527 **– R.T. Cristina (Editor in Chief) can be found to Pharmacology discipline or on line**			

1.	Bazele farmacologiei veterinare.	**Cristina R.T.**	Brumar, Timişoara, (2004) 973-9295-78-9,
2.	Biotehnologii farmaceutice şi Industrializarea medicamentului de uz veterinar.	**Cristina R.T.,** P.A. Darău.	Vasile Goldiş Univ. Press, Arad. (2005) ISBN 973-664-072-8
3.	Introducere în farmacologia şi farmacia veterinară.	**Cristina R.T.**	Solness Timişoara (2006) ISBN (10) 973-729-064-X; I, (13) 978-973-729-064-9
4.	Ghid de farmacie și terapeutică veterinară.	**Cristina R.T.,** Teușdea V.	Brumar Timişoara. (2008) ISBN 978-973-602-354-5
5.	Elemente de farmacovigilență și toxicovigilență în medicina veterinară.	**Cristina R.T.** Chiurciu V.	(2010) Brumar Timisoara
6.	Ghid de dozaj şi teste de Farmacologie veterinară. Ed. 1, Ed. 2 ad.	**Cristina R.T.**	Brumar Timişoara (2004) 973-8057-46-9, 973-602-020-7
7.	Receptură, Calcul şi Interacţiuni în Medicina Veterinară	**Cristina R.T.**	Sedona Timişoara (2003) 973-9345-42-5 ,
8.	Practicum de farmacologie şi terapie veterinară	**Cristina R.T.,** Darău P.A., Dumitrescu E.	Vasile Goldiş Univ. Press, Arad. (2005) 973-664-071-X
9.	Dicţionar bio-medical.	**Cristina R.T.,** Dumitrescu E, Teuşdea V.	Impact Media Timişoara. (2007) 978-973-7996-21-3
10.	Dermatologie medicală - veterinară	Pop Pavel, **R.T. Cristina** (1996)	Mirton Timişoara, 973-578-025-9

Selection of English titles

1.	Pharmacology	Mycek M.J., Harvey R.A.,Champe P.C.	Lippincott Williams & Wilkins; 2000
2.	Farmacologia Veterinaria	Carli – Ormas – Re - Soldani	Idelson-Gnocchi; 2009
3.	Veterinary Applied Pharmacology & Therapeutics	Brander G.C., Pugh D.M., Bywater R.J., Jenkins W.L.	Baillière Tindall; 1991
4.	Handbook of Veterinary Drugs	Allen D.G., Pringle J.K., Smith D, Conlon P.	J.B. Lippincott Company; 1993
5.	Terapia Antimicrobica in Medicina Veterinaria	Prescott J.F., Baggot J.D., Beretta C.	EMSI; 1996
6.	Farmacologia e Terapeutica Veterinaria	Adams H.R., Beretta C.	EMSI-ROMA; 1999
7.	Recent Advances in the Chemistry of β-Lactam Antibiotics	J. Elks	The Chemical Society; 1977
8.	Essential facts of Blood Presure in Dogs and Cats	Egner B.,Carr A., Brown S.	VBS VetVerlag, Buchhamdel und Seminar GmbH; 2007
9.	The Merk Veterinary Manual	Kahn C.M., Line S.	MERIAL; 2005
10.	The complete Aquarium Guide-Fish, Plants and Accessories for your Aquarium	Blanchout V.,Bresson M., Castaing S.	KÖNEMANN; 2005
11.	Die Große Pflanzen-apotheke	Hoffmann D.	MOSAIK; 1996
12.	Determination of Doses of Veterinary Pharmaceuticals	Powers, J.D., Powers T.E.	The Ohio State University Press Columbus; 1984
13.	Clinical Trials with Therapeutic Drugs in Animals	Powers T.E., Powers J.D.	The Ohio State University Printing Facility Columbus; 1986
14.	Does the Animal Drug Prescription and Over-the-Counter Issue Impact Human and Animal Health?	Powers T.E., Powers D.	B and L Graphics; 1988
15.	Biotechnology in the Animal Health Section: scientific, regulatory and ethical implications	Powers T.E., Powers J.D.	B and L Graphics; 1990
16.	Prontuario dei Principi Attivi-animali da reddito	Zagni P., Beretta C.	PVI Point Veterinaire Italie; 2003
17.	Handbook of Pharmacology-the actions and uses of drugs	Cutting W.C.	ACC - Appleton-Century-Crofts; 1972
18.	Controlled Drug Delivery	Müller B.W.	Wissenschaftliche Verlagsgesellschaft GmbH; 1987
19.	Compendium of Data Sheets for Veterinary Products 1992-1993	NOAH-National Office of Animal Health	Datapharm Publications Limited;
20.	Bewährte Indikationen der Homöopathie in der Veterinärmedizin	Rakow B, Rakow M.	Sonntag; Berlin 2011
21.	Animal Health Products	Hoechst Veterinär GmbH	Hoechst; 1992
22.	Dictionnaire des Médicaments Vétérinaires et des produits de Santé Animale diagnostic, diététique, hygiène, petit matériel	Meissonnier E., Devisme P., Lambert P.J.	Editions du Point Vétérinaire; 1997
23.	Editions du Point Vétérinaire	Vagni S., Zagni P.	PVI Point Veterinaire Italie; 2003
24.	Pharmacological Bases of Rational Liver Therapy	Timar M	Sibiu Printing House; 1982
25.	Állatghyóghyászati Készítmények	Perényi J.	PRIMA-VET; 2002
26.	Handbook of Animal Science	Putnam, PA	Academic Press; 1991
27.	Veterinary Applied Pharmacology and Therapeutics	Brander G.C., Pugh D.M.	Baillière Tindall; 1971
28.	Compendium Spécialités Pharmaceutiques vétérinaires	Association Générale de L'Industrie du Médicament	A.G.I.M.; 1985
29.	Veterinary Pharmacology-a practical guide for the veterinary nurse	Amanda H. Rock	Butterworth Heinemann Elsevier; 2007
30.	The Pharmacological Basis of Therapeutics	Goodman L.S. Gilman A.	Macmillan; 1966
31.	Small animal Clinical Pharmacology and Therapeutics	Boothe M.D.	Saunders; 2001

32.	Perspectives in Clinical pharmacy	Donald E. Francke D.E., Harvey A., Whitney K.	Drug Intelligence Publications; 1972
33.	Selbst-medikations-Liste	Ullmann M., Hammann U.	Deutscher Apotheker Verlag Stuttgart; 1995
34.	Prontuario Terapeutico Veterinario- medicina animali da reddito, bovini, suini, ovi-caprini	Villa R.	Edizioni Veterinarie; 2008
35.	Ganzheitliche Schmerztherapie für Hund and Katze	Kasper M., Zohmann A.	Sonntag; 2011
36.	Kursbuch Medikamente und Wirkstoffe	Von Maxen A., Hoffbauer G., Heeke A.	Weltbild; 2005
37.	Apotekens Läkemedels Register	Wahlgren S.	APOTEKSBOLAGET; 1988-1989
38.	Das Neue grosse Buch der Homöopathie	Karol D., Degel O.	Serges Medien; 2000
39.	Topics in Veterinary Pharmacology	Powers J.D., Powers T.E.	The Ohio University Press Columbus; 1982
40.	Veterinary Dermatology	Von Tscharner C., Halliwell R.E.W.	Baillière Tindall; 1990
Selection of Romanian titles			
1.	Farmacologia în laboratorul clinic	Dumitraşcu V., Cinca R., Daliborca C.V., Matusz A.A., Chevereşan A., Grecu D. Ș., Malița I., Ana D	Editura de Vest, Timișoara, 2007
2.	Farmacoterapie veterinară	Stătescu C, Crivineanu V, Crivineanu M	Ed. Fundației ”România de Mâine”, București, 1997
3.	Farmacologie veterinară	Nueleanu V.I.	Ed.AcademicPres, Cluj-N, 2002
4.	Bazele farmacologice ale terapeuticii veterinare	Cernea M.	Ed. AcademicPres, Cluj-N, 2009
5.	Ghid practic de antibioticoterapie	Angelescu M.	Ed.Medicală, București, 1988
6.	Vademecum Terapeutic	Ionescu-Amza G.	Ed. Medicală, București, 1973
7.	Terapeutică Veterinară	Codreanu M., Maria Crivineanu	Ed. Printech, București, 2007
8.	Farmacologie Veterinară	Nueleanu V.I.	Ed. Risoprint, Cluj-Napoca, 2006
9.	Farmacologie Veterinară	Nueleanu V.I., Bogdan I.	Ed. Nobile, Cluj-Napoca, 1999
10.	Curs farmacologie	Cinca R., Popovici M., Dumitrașcu V.	Ed. Mirton, Timișoara, 2006
11.	Ecotoxicologie	Trif A., Florin Muselin F.	Ed. Eurobit, Timișoara, 2014
12.	Compendiu de Botanică Medicală	Trif A., Curtui V.G.	Ed. Brumar, Timișoara, 1997
13.	Farmacopeea Română	Sub redactia D. Dobrescu	Ed. Medicală, Buc., ed. X, 2000
14.	Farmacocinetica	Lecuța S.E, Pop R.D.	Ed. Dacia, Cluj-Napoca, 1981
15.	Farmacologie	Tica A., Victor Voicu	Ed. Medicală Universitară Craiova, 2004
16.	Supozitoare	Popovici A., Ban I.	Ed. Medicală, București, 1988
17.	Toxicologie sanitară veterinară	Râpeanu M.D.	Ed. Ceres, București, 1983
18.	Structura cristalină și biodisponobilitatea substanțelor medicamentoase	Grecu I., Monciu D.	Ed. Medicală, București, 1984
19.	Farmacologie: curs pentru studenții Facultății de Stomatologie	Mihăilescu M.	Litografia I.M.T., Vol. I, 1980
20.	Biotehnologii farmaceutice	Coman M., Bota C., Pop C.	Ed. Medicală Universitară ”Iuliu Hațieganu”, Cluj-Napoca, 2004
21.	Vademecum medical veterinar - Farmavet	Holban D., Stătescu C.	Civitas, Chișinău, 1999
22.	Plante medicinale în terapeutică	Mocanu S., Răducanu D.	Ed. Militară, București, 1983
23.	Antibioticele	Balș M.G.	Ed. Medicală, Buc., ed a II-a, 1965
24.	Elemente de farmacie clinică	Simiti I.	Ed. Dacia, Cluj-Napoca, 1984
25.	Preparate farmaceutice	Popovici A., Gafițanu E., Suciu Gh., Motocescu R.	Ed. Medicală, București, 1987
26.	Îndreptar profilactic și terapeutic de medicină naturistă	Laza D.	Ed. Păzitorul Adevărului, Făgăraș, 1997
27.	Agresologie, anestezie și terapie intensivă în medicină veterinară	Bolte S., Moldovan M.	Ed. Ceres, București, 1981
28.	Forme farmaceutice de uz veterinar	Suciu Gh.	Ed. Dacia, Cluj-Napoca, 1990
29.	Elemente de patofarmacologie clinică	Urseanu I, Voicu V.	Ed. Militară, București, 1983
30.	Medicația sistemului nervos vegetativ	Dragomir N.	Ed. Medicală, București, 1975
31.	Tehnică farmaceutică	Stănescu V.	Ed. Medicală, București, 1983
32.	Tehnică farmaceutică	Ionescu Stoian I., Ciocănelea V., Adam L., Ban I., Rub Saidac A., Georgescu E.	Ed. Didactică și Pedagogică, București, ed. a II-a, 1974
33.	Nomenclatorul produselor medicamentoase de uz uman	Agenția Națională a Medicamentului (ANM)	Ed. Medicală, București, 2002
34.	Antibioticele	Balș M.G.	Ed. Medicală, Buc., ed a II-a, 1965
35.	Agresologie, anestezie și terapie intensivă în medicină veterinară	Bolte S., Moldovan M.	Ed. Ceres, București, 1981
36.	Bazele farmacologice ale terapeuticii	Goodman L.S., Gilman A.	Ed. Medicală, Buc., ed. a II-a, 1960
37.	Toxicologie	Cotrău M., Popa L., Stan T., Preda N., Kincses-Ajtay M.	Ed. Didactică și Pedagogică, București, 1991
38.	Tratat de plante medicinale și aromatice cultivate	Păun E., Mihalea A., Dumitrescu A., Verzea M., Coșocariu O.	Ed. Academiei Republicii Socialiste România, Vol. II, 1988
39.	Hormonoterapia în reproducția animală	Paraipan V.	Ed. Ceres, București, 1982
40.	Forme farmaceutice de uz veterinar	Gh. Suciu	Ed. Dacia, Cluj-Napoca, 1990

41.	Plante medicinale, fitochimie și fitoterapie	Ciulei I, Grigorescu E., Stănescu U.	Ed. Medicală, Buc., Vol. I, 1993
42.	Farmacocinetica în terapia medicamentoasă	Leucuța S.	Ed. Medicală, București, 1989
43.	Terapeutica veterinară	Marinescu I.	Ed. Agro-Silvică, București, 1965

Teaching methods:
Exposure topic - Explanation - Demonstration - Problem-solving - Case Study. Individual and collective reflection through: observation, simulation, laboratory experiments and projects.

9. Corroborating discipline contents with the expectations of the representatives of epistemic community, of the professional associations and of the employers in the field related to the programme

The main issues to be accumulated to the Pharmacology discipline are:
- The knowing of the main drug groups.
- The knowing of them pharmacokinetics, of modes and mechanisms of action and of them possible toxic effects.
- The knowledge of: the incompatibilities, aspects lied to the animals' species, to the administration way.
- Abilities to solve the therapeutic cases including: the calculation of the dose, choosing of the right active substance and proper drafting of the medical ordinance, the recommendation (where applicable) of the withdrawal period.
- Knowledge of the importance of the drugs combination of them toxicity level in determining the maximum residue limits for meat, milk, eggs and fish etc..

In this way, the basic pharmacological gained knowledge should be applied in the veterinary degree courses within the areas of general medicine and/or therapeutics.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share of the final grade (%)
10.4 Course	Examining course	writting / oral	**75-80**
	Partial exam (written) One/Semester **(on recquest)**	writting	**(5)**
10.5 Lab. / Practical works	Examinining P.W./ Semester		**10**
	Active participation to P.W./ Semester	Colocvium in Prescribing and therapeutic calculations	**5**
10.5. Projects / reports	Bibliografic referates / Semester	PPT presentations.	**5**
10.6. Admission criteria at the final evaluation	Presence to more than 10 courses / Semester is decidual for the passing mark decission. Presence to all practical works / all seminaries with final evaluation / Semester		

10.7. **Minimum performance standard**

Is in the respect of *day one skills* mainly:
- Knowing the groups/classification of the veterinary drugs and them main mechanisms of action, knowing the importance of withdrawal periods (where is applicable).
- Resolving a case by calculating the necessary (drug / concentration / volume etc.) for treatment / application and the correct drafting of a medical recipe.

Date the form was filled in	Signature of the course leader Prof. Dr. Romeo T. Cristina	Signature of the seminar leader Prof. Dr. Romeo T. Cristina
....	....	....

Date the form was approved	Signature of the Department Director Prof. Dr. Ion Oprescu
....	....