# - Nutrition and Animal Feeding

## Prof. Antonio Gallo

***Text under revision. Not yet approved by academic staff.***

COURSE AIMS AND INTENDED LEARNING OUTCOMES

The course aims to provide the necessary basics for the study of animal nutrition and the estimation of the nutritional value of foods destined for ruminants and monogastrics. For this reason, it addresses the issues related to the methods that can be used to determine the energy value, quality and protein and lipid content of foods according to the species for which they are intended.

The course also aims to give students the rudiments of rationing and formulation for the different species of zootechnical interest, as well as the fundamental principles of food preservation.

The aim of the course is to equip students with a simple language for expressing the evolution of a practical event clearly and with the necessary scientific rigour and linking it to its relative theoretical concept.

INTENDED LEARNING OUTCOMES

At the end of the course, students will be able to correctly estimate the nutritional value of foods destined for the various species of zootechnical interest, as well as evaluate their preservation conditions. They will learn about the traditional and more advanced analysis techniques needed for the nutritional evaluation of foods, depending on whether diets or complete and complementary feeds are being formulated.

In particular, at the end of the course students will possess the following knowledge and ability to understand:

* Basic knowledge of the chemical composition of foods and the analytical techniques used to determine the nutritional principles necessary for determining nutritional value;
* Chemical and nutritional characteristics of vitamins and minerals (macro and micro elements);
* Methods of food and fodder preservation, and the ability to assess these based on analytical indicators;
* Evaluate the nutritional characteristics of protein sources according to their destination in feeds and diets for animals in livestock production;
* To be able to assess the quality and wholesomeness of water and food intended for animal nutrition.

Furthermore, students will have developed the following skills:

* To interpret and evaluate data, perform laboratory procedures according to the indications provided and conduct simple experiments, solve problems and exercises related to the theoretical aspects covered in the course;
* Possess the ability to present their knowledge in a clear and orderly manner, with appropriate scientific language and using rigorous arguments;
* Working in small groups in synergy with other students.

COURSE CONTENT

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|  | ECTS |
| Water as food. Characteristics of drinking water (mineral composition and toxic factors). Use of water as a vehicle for nutrients. | 1.0 |
| Macro-nutrient content of foods for livestock use (raw materials, green fodder, high-humidity silage, concentrated feed, dry industrial by-products and wet industrial by-products). | 1.0 |
| Vitamins. Definition, classification, metabolic functions and deficiency symptoms.  Minerals. Definition, classification, presence in the organism, metabolic functions, definition of needs and particular implications. | 1.0 |
| Nutritional evaluation of foods. Main foods for zootechnical use. Food energy distribution. Apparent and real digestibility. Effect of ingestion level on digestibility. Effect of digestible energy level on the metabolisable and net energy utilisation level. | 1.0 |
| Enzymatic and biological methods of food evaluation. Enzymatic digestibility of starch. Fermentability of starch and non-structural carbohydrates. Gas production method. In situ degradability of fibre (NDF). Enzymatic degradability of NDF (neutral detergent fibre). | 1.0 |
| Determination of energy value. According to NRC 2001 and NASEM 2021. Calculation for pigs. Calculation for poultry. | 1.0 |
| Protein evaluation (essential and non-essential amino acids). Concept of the ideal protein for monogastric and ruminant species. Composition of microbial, milk and meat proteins. Use of essential amino acid hydroxy analogues. Chemical Score, PER (Protein Efficiency Ratio), Biological Value. Analysis of protein fractions using the Cornell method. Degradability of in situ proteins. | 1.0 |

READING LIST

Antongiovanni M., Buccioni A., Mele M. *Nutrizione degli animali in produzione zootecnica*. Edagricole-New Business Media, 2019.

Cevolani D., *Alimenti per la vacca da latte e bovini da carne*, Edagricole, Bologna, 2023.

McDonald, P., Edwards, R., Greenhalgh, J., Morgan, C., L.A. Sinclair and R.G. Wilkinson (2014). Animal Nutrition. 7th ed. Essex: Addison Wesley Longman Limited.

Ronchi B., Savoini G., Trabalza Marinucci M., 2020. *Manuale di nutrizione dei ruminanti da latte. EdiSES Università S.r.l. – Naples.*

NRC, 2001. *Nutrient requirements of dairy cattle, National Academy Press, Washington D.C., 2001.*

NASEM, 2021. *Nutrient Requirements of Dairy Cattle, Eighth Revised Edition, National Academy Press, Washington D.C., 2021.*

TEACHING METHOD

The course is run over the second four-month period. The teaching methods include:

Lectures accompanied by application examples, which will present the theoretical principles and the methods for solving and calculating exercises and problems (56 hours; 7 ECTS). Lectures will be held with the aid of slides and/or the blackboard, while visits to companies in the sector are also envisaged, with practical demonstrations of diet formulation, food evaluation, and the problem-solving of real cases.

ASSESSMENT METHOD AND CRITERIA

The exam will be in two parts: a written interim test and a final oral exam. An optional, non-binding interim test is envisaged, especially useful for students to ascertain their actual knowledge of the concepts presented during the first part of the course. The tests are based on 30 multiple-choice questions. The questions asked in the interim written test will all carry the same weight, with 0 (in the case of no answer) or 1 (in the case of an exemplary answer). The results of the tests will be a topic for discussion and clarification during subsequent lectures in order to allow students to learn and clarify the concepts presented up to that point; however, they will not exclude a student from taking the final oral exam.

At the end of the course there will be a final oral exam, both for those students who took and passed the interim test, and for those students who didn't take or failed the interim test.

NOTES AND PREREQUISITES

Students must possess a good basic knowledge of animal anatomy and physiology, inorganic and organic chemistry, and biochemistry.

Further information can be found on the lecturer's webpage at http://docenti.unicatt.it/web/searchByName.do?language=Eng or on the Faculty notice board.