



Study Plan

School: School of Sciences and Technology

Degree: Bachelor

Course: Applied Animal Science (cód. 642)

1st Year - 1st Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT11377L	Mathematics	Mathematics	6	Semester	156
BIO10917L	Cell Biology	Biological Sciences	6	Semester	156
QUI12344L	General Organic Chemistry	Chemistry	6	Semester	156
ZOO12369L	Introduction to Animal Science and Technology	Animal Science	6	Semester	156
Free Option					

1st Year - 2nd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ZOO12370L	Animal Anatomy and Physiology I	Animal Science	6	Semester	156
MAT11462L	Statistics	Mathematics	6	Semester	156
BIO0408L	Microbiology	Biological Sciences	6	Semester	156
QUI7211L	Fundamentals of Biochemistry	Biochemistry	6	Semester	156
ZOO12371L	Agricultural and Animal Production Organization	Animal Science	6	Semester	156

2nd Year - 3rd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ZOO12382L	Animal Anatomy and Physiology II	Animal Science	6	Semester	156
MVT1028L	Notions of Animal Health	Veterinary Medicine	6	Semester	156
ZOO12383L	Comportamento e Bem-Estar Animal	Animal Science	6	Semester	156
FIT12384L	Agricultural Systems and Technology	Agronomy	6	Semester	156

Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ERU12378L	Principles of Engineering Applied to Animal Science	Rural Engineering	6	Semester	156
ERU12379L	Information and Automation Systems in Animal Science	Rural Engineering	6	Semester	156
ERU12390L	Facilities and Equipment	Rural Engineering	6	Semester	156



2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ZOO12385L	General Basis of Agricultural Projects	Animal Science	6	Semester	156
MVT12386L	Animal Reproduction: Physiology and Control	Veterinary Medicine	6	Semester	156
ZOO12387L	Genetics and Breeding Techniques	Animal Science	6	Semester	156
ZOO12388L	Animal Nutrition	Animal Science	6	Semester	156
ZOO12389L	Equine and Companion Animal Studies	Animal Science	6	Semester	156

3rd Year - 5th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ZOO12372L	Ruminant Production Systems and Techniques	Animal Science	6	Semester	156
ZOO12373L	Non-Ruminant Production Systems and Techniques	Animal Science	6	Semester	156
ZOO12374L	Alternative Production Systems and Techniques	Animal Science	6	Semester	156
ZOO12375L	Food and Food Technologies for Animals	Animal Science	6	Semester	156
ZOO12381L	Technological Processes and Food Quality	Agricultural and Food Engineering	6	Semester	156

*** TRANSLATE ME:UC's do 3º Ano de recuperação no 5º semestre ***

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ZOO12376L	* Internship in Professional Context	Animal Science	12	Semester	312

3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ZOO12376L	Internship in Professional Context	Animal Science	12	Semester	312
ZOO12377L	Project	Animal Science	6	Semester	156

Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ZOO12391L	Ciência e Tecnologia do Leite e Derivados	Agricultural and Food Engineering	6	Semester	156
ZOO12392L	Science and Technology of Meat and ByProducts	Agricultural and Food Engineering	6	Semester	156
ZOO12393L	Science and Technology of Other Products of Animal Origin	Agricultural and Food Engineering	6	Semester	156
ZOO12380L	Animal Production in Tropical and Subtropical Regions	Animal Science	6	Semester	156



Conditions for obtaining the Degree:

*** TRANSLATE ME: Para obtenção do grau de licenciado em Ciência e Tecnologia Animal é necessário obter aprovação a 156 ECTS em unidades curriculares obrigatórias e 24 ECTS em unidades curriculares

optativas, distribuídas da seguinte forma:

1º Ano

1º Semestre:

4 UC Obrigatórias num total de 24 ECTS

UC Optativa Livre de 1º ciclo nas áreas científicas de Informática, Economia, Sociologia ou Linguística num total de 6 ECTS

2º Semestre

5 UC Obrigatórias num total de 30 ECTS

2º Ano

3º Semestre

4 UC Obrigatórias num total de 24 ECTS

1 UC Optativa do Quadro de Opativas do 3º semestre num total de 6 ECTS

4º Semestre

5 UC Obrigatórias num total de 30 ECTS

3º Ano

5º Semestre

5 UC Obrigatórias num total de 30 ECTS

6º Semestre

2 UC Obrigatórias num total de 18 ECTS

2 UC Optativas do Quadro de Opativas do 6º semestre num total de 12 ECTS

Program Contents

[Back](#)

Mathematics (MAT11377L)

Linear systems. Eliminations of Gauss. Matrices and vectors. Operations with matrices. Determinants. Inverse matrix. Cramer's Rule.

Functions, Limits, and Continuity. Inverse and composite functions. Limits of numerical successions. Continuous functions and their properties.

Differential Calculus and Applications. Derivatives of composite, implicit, and inverse functions. Logarithmic differentiation. Theorems of Fermat, Rolle, Lagrange and Cauchy. Rule of L'Hôpital. Taylor's formula. Numerical differentiation. Applications of derivatives.

Integral Calculus and Applications. Primitives. Methods of primitivation: by substitution and by parts. Primitives of rational functions. Integral. The fundamental theorem of integral calculus. Numerical integration. Applications of integrals. Improper integrals. Power series.

Ordinary Differential Equations. Euler's method. First order separable and linear differential equations. Applications in the natural sciences.

[Back](#)

Cell Biology (BIO10917L)



[Back](#)

General Organic Chemistry (QUI12344L)

Scope of organic chemistry and importance in society. Fundamentals of structure, bonding and properties of organic compounds. Families of organic compounds, nomenclature and structural representation. Basic concepts of stereochemistry. General physical and chemical properties of organic compounds. Examples of organic reactions. Synthetic polymers and biomolecules. Synthesis techniques, separation and analysis of organic compounds. Safety, hazards and waste disposal of organic residues.

[Back](#)

Introduction to Animal Science and Technology (ZOO12369L)

The functions of animals and animal science in human live (introduction to animal science and technology, the value of animals to mankind, factors affecting the worldwide structure of agriculture, world diversity of agriculture production systems). The core biological sciences for animal science (an introduction to the various disciplines, from animal nutrition to animal welfare, through new biotechnology tools and genetic engineering). The animal industries (vertical integration of different animal productions: from swine and poultry to apiculture, aquaculture or companion, sports and leisure animals). Animals and society (main professional careers in animal science, food safety and other human concerns, animal welfare and animal rights and the role animals play in sustainable agriculture).

[Back](#)

Animal Anatomy and Physiology I (ZOO12370L)

Part I: General Organization of the Animal Body

Introduction to Animal Anatomy and Physiology

General organization of the animal organism

Anatomical terminology

Part II: Protection, Support and Movement

Skeletal System: Axial Skeletal and Appendicular Skeletal: structure and function

Joints

Anatomo-Functional Classification of Joints

Muscular system: types and mechanisms of muscle contraction

Part III: Control, Communication and Coordination

Neurons: Functional and anatomical structure and neural circuits

General Organization of the Nervous System: Peripheral and Central Nervous System

Endocrine System

Endocrine Glands: Secretion, Control and Mechanisms of Hormone Action

Hormones

Part IV: Introduction to Transport and Maintenance

The Cardiovascular System

Anatomical structure of the heart and blood vessels

Physiology of the heart

Blood composition and blood cells

Systemic circulation and pulmonary circulation

Basic concepts of immunity

[Back](#)

Statistics (MAT11462L)

[Back](#)

Microbiology (BIO0408L)



[Back](#)

Fundamentals of Biochemistry (QUI7211L)

[Back](#)

Agricultural and Animal Production Organization (ZOO12371L)

Historical evolution of agriculture. Animal production at national level (by region), European and global dimension: production and producers and main characteristics of production systems for the various livestock species; Markets and prices of animal products at national, European and global levels. Recent developments in agricultural policy that affect animal production, with emphasis on the CAP and the WTO. Portugal agrisystems; Factors and characteristics of farming and livestock systems in Portugal. Agriculture and environment: environmental integration into the common agricultural policy (CAP); Good agricultural practices and sustainable use of natural resources. CAP requirements in the exercise of livestock production within a framework of ethical and social responsibility of producers in ensuring animal welfare and food security. Institutional organization of agricultural sector and national programmes of support for agriculture and rural development.

[Back](#)

Animal Anatomy and Physiology II (ZOO12382L)

1. Digestive system. Anatomy of the digestive tract. Regulation of gastrointestinal function. Digestive secretions. Mechanisms of digestion and absorption. Digestion in monogastrics, ruminants, and birds.
2. Respiratory system. Anatomical structure. Mechanics of breathing. Exchange and transport of gases and regulation of respiration.
3. Urinary System. Anatomy of the kidney and accessory structures. Mechanisms of urine formation. Factors that regulate diuresis. Water and acid-base balance.
4. Body temperature regulation. Body temperature. Physiological responses to heat and cold. Hypothermia and hyperthermia.
5. Male and female reproductive system. Oestrus. Fertilization. Pregnancy. Parturition.
6. Lactation. Structure, growth, and development of the mammary gland. Lactogenesis, galactopoiesis, composition, milk secretion and ejection. Milking. Factors affecting production and milk composition.

[Back](#)

Notions of Animal Health (MVT1028L)



[Back](#)

Comportamento e Bem-Estar Animal (ZOO12383L)

1. The study of animal behaviour and its applications.
 - 1.1 Learning to see: animal observation
2. Behaviour and physiology
 - 2.1. Sleep
 - 2.2. Feeding behavior
 - 2.3. Central regulation
3. The organisation of behavior.
 - 3.1. Motivation
 - 3.2. Emotions
4. Developing, learning and cognition.
 - 4.1. Clicker training
5. Living in group
 - 5.1. Reproductive behavior
 - 5.2. Maternal behavior
 - 5.3. Common social behavior: grooming and agonistic behaviour
6. Abnormal behaviour, stress and welfare.
7. Human-animal relations.
 - 7.1. Facilities
 - 7.2. Legislation
 - 7.3. Handling

[Back](#)

Agricultural Systems and Technology (FIT12384L)

1. Climate
 - 1.1. Climate and agriculture
 - 1.2. Characterization of the Mediterranean climate and its aptitude for agriculture production
2. Soil
 - 2.1. Soil as agricultural resource
 - 2.2. Characteristics of the main soil types and their aptitude for agriculture
3. Crops
 - 3.1. Crops adapted to the Mediterranean environment
 - 3.2. Definition of crop rotations and their spatial distribution on a farm
4. Pastures
 - 4.1. Introduction and concepts of pasture utilization
 - 4.2. Utilization of natural and improved pastures
5. Forages
 - 5.1. Concept of forage and its classification
 - 5.2. The importance of forages for animal feeding
 - 5.3. Forage conservation methods
6. Agricultural machinery
 - 6.1. Machines for crop establishment, fertilization, spraying and harvest
7. Forestry
 - 7.1. Forests and biodiversity
 - 7.2. Forestry systems with and without grazing
 - 7.3. Forest use and hunting management
8. Crop fertilization
9. Crop protection
10. Extensive animal production



[Back](#)

Principles of Engineering Applied to Animal Science (ERU12378L)

Force. Moment. Static equilibrium. Efforts on the axles of tractors. Influence of the implement in the distribution of the load on the axles of the tractor. Soil compaction. Trafficability. Load security.

Applications on oil-dynamic in agriculture and livestock equipment. Mechanical transmissions for agricultural and livestock equipment.

Energy, power and performance. Motor and power bar. Field capacity and performance of field. Scaling peer-tractor implement.

Electricity:

Electric Fields. Isolators and Conductors. Electric Potential. Condensers and conservation of electric energy. Current and resistance. Electric circuits. Electric equipment and installations.

Thermodynamics, heat and mass transfer:

Mass and Thermal Balance. Fundamentals of Thermodynamics. Sensible and Latent Heat. Process of Heat Transfer. Moisture and Psychometrics. Psychometric charts. Environmental control of Livestock Buildings. Homeothermy. Heat transfer between animal and surroundings.

[Back](#)

Information and Automation Systems in Animal Science (ERU12379L)

- Introduction to computer and automation systems; advanced use of spreadsheet and database;

Programming; hardware (computer parts, I/O); introduction to electronics; sensors and data loggers; PLC and automations;

Notions of geo-referencing; electronic subsystems of farm machinery; monitoring (sensors); Monitoring and instrumentation panel; control with data input (interactive).

Applications: in equipment for preparation, conditioning and distribution of animal feed and in equipment for transporting and spreading animal sub products; control with data recording and GPS connection

[Back](#)

Facilities and Equipment (ERU12390L)

Planning of animal housings. Legislation, localization, orientation, dimensions, quantification. Layout. Quantification of animal housing and spatial distribution. Waste management. Monitoring and control systems.

[Back](#)

General Basis of Agricultural Projects (ZOO12385L)

- The concepts associated with the agricultural undertaking: concept of enterprise and farm; specificities of the agricultural undertaking; the process of production in the agricultural context.

- Concepts related with the economics of agricultural production: the production, supply, demand, elasticity, markets and prices.

- Investment and projects: basic notions; framework in the context of the agricultural enterprise; the classification of the investments.

- Concepts and principles associated with the financial and economic analysis of agricultural enterprise; rates and values; capitalization and updating; inventory of agricultural capital.

- Technical-economic evaluation of productive activities: indicators and activity budgets of viability.

- Global and estimates budgets: the process of preparing and main results to consider.

- Investment analysis: time factors and inflation; the criteria of profitability.

- Decision-making: strategies; the array of decision; decision criteria.



[Back](#)

Animal Reproduction: Physiology and Control (MVT12386L)

Sexual differentiation and sex biology. Male and female reproductive organs; General endocrinology of reproduction; Endocrine control of the biological cycles of reproduction; Folliculogenesis, oogenesis and spermatogenesis;

In farm animals: Mating physiology and specificities; Gametes transport and survival in the female genital tract. Fertilization, cleavage and implantation. Pregnancy stages; The parturition and the puerperal period. Mainly in horses, sheep and cattle: histo-morpho-physiological particularities of male and female genital systems;

Particularities of biological cycles of reproduction; Particularities of pregnancy, parturition and puerperal period; The auxiliary reproductive technologies; Estrus detection; Pregnancy diagnosis; Artificial insemination; Induction and synchronization of ovulation; Embryo transfer; - The reproductive efficiency.

PRACTICAL: Laboratory and / or in vivo exemplification of all matter, contained in the theoretical program.

[Back](#)

Genetics and Breeding Techniques (ZOO12387L)

1. Classical Genetics :

1.1- Important Mendelian Genes in animal production.

2- Molecular Genetics.

2.1- DNA and RNA;

2.2- Recombinant DNA and Genetic Engineering.

3- Cytogenetic.

3.1- Chromosomes abnormalities;

3.2- Translocation;

3.3- Inversion;

3.4- Centric Fusion (evolution of species).

4- Population Genetics.

4.1- Hardy-Weinberg law;

4.2- Changes in gene frequencies;

4.3- Inbreeding. 5- Genetic improvement.

5.1- Heritability and Repeatability;

5.2- Selection.

5.2.1- Selection methods for a single character;

5.2.2- Association among characters: Indirect Response to selection.

5.2.3- Simultaneous selection for multiple characters - Selection Indexes.

6- Núcleous Breeding System.

7- Crossbreeding.

7.1- Types of crossbreeding;

7.2- Synthesis of a new breed.

8- Preservation of endangered breeds.

8.1- Methods "in situ" and "ex situ" .

9- The biotechnology in animal breeding: reproductive and molecular methods.

10- Rules to observe in a breeding program at the farm, breed and national level.



[Back](#)

Animal Nutrition (ZOO12388L)

1. Feeds (concept of feed and nutrient analysis of feed).
2. Nutrients (the main nutrient groups, their properties and functions in animals).
3. Digestibility and digestive kinetics (bioavailability of nutrients and the importance of determination, factors affecting digestibility).
4. Energy and energy systems [energy content of feeds (gross, digestible, metabolizable and net energy) and energy evaluation systems for ruminants, monogastric and pets].
5. Protein and protein systems (protein quality of food and protein evaluation systems for both monogastric and ruminant) systems. Interactions between energy and protein.
6. Voluntary food intake.
7. Nutritional requirements of animals (needs for maintenance, growth and fattening, breeding, egg production and lactation).
8. Feed formulation.

[Back](#)

Equine and Companion Animal Studies (ZOO12389L)

Module 1 – Dog

1. The evolution of the genus Canis sp.
2. Domestication of the Dog
3. Biology and behavior
4. The ontogenic development of the dog
5. The genetic influence on behavior
6. Learning and Teaching
7. behavioral disorders

Module 2 - Horse

1. Origin, domestication and evolution of the horse and other equines
2. Distribution of horses in the world.
3. Use of the horse in the World
4. Evolution of the stud industry
5. Functional Assessment of the horses in the various methods of production.
6. Major equestrian activities
7. Equine reproduction
8. Nutrition and feeding of horses
9. Feeding behavior of horses.
10. equine Grooming
11. The behavior of the horse in the wild and captivity.
12. Prevention of locomotor disorders, digestive and respiratory
13. Prophylaxis of infectious diseases and parasitic diseases.
14. Management of foals
15. Accommodations, production structures and sports

[Back](#)

Ruminant Production Systems and Techniques (ZOO12372L)

Frameworks Productions of sheep, goats and cattle according the economic, social and political realities in Portugal and Europe. Its evolution and trend scenarios. Biological cycle and production cycle. Management of breeding and reproductive efficiency. Selection schemes and animal breeding examples for species and within species).



[Back](#)

Non-Ruminant Production Systems and Techniques (ZOO12373L)

Pig Production: characterization of the sector. Reproductive management. Feed management. Intensive and extensive pig production systems. Carcasses, meat and processed products. Factors affecting meat and products quality.

Poultry and Rabbit Production: Characterization of poultry and rabbit sectors. Poultry production [including laying hens and breeders, broilers, turkeys, waterfowl (ducks and geese) game birds (pheasant, grouse) and several species (ostrich, quail)] . Production of rabbits. Products (characterization of poultry and rabbit, egg quality, factors affecting the quality of meat and eggs).

[Back](#)

Alternative Production Systems and Techniques (ZOO12374L)

The animal productions to be studied (apiculture, aquaculture, key game species and main laboratory animals) will be approached respecting, at least, the following common approach: origin, evolution, and current state; species' anatomic and physiologic bases; biogeography of the (sub)species; species' regulation strategies (at individual and colony level); strategies and behaviours to react to environmental changes; basics of facilities/equipments, behaviour, and well-being, feeding, reproduction; animal health and pathology; management practices, production types and derived products; production ecology and ethics; notions of production economy and markets; major regulatory frameworks; possible integration in other bio-production systems; major sector-specific difficulties faced nowadays and expected developments.

[Back](#)

Food and Food Technologies for Animals (ZOO12375L)

Interaction between production and use of pastures. Nutritional requirements of grazing animals. Factors affecting the efficiency of grazing (pasture availability, quality pasture, grazing systems, behavior of grazing animals). Principles of supplementation of grazing animals. Principles of forage conservation. Nutritive value of silages and factors of variation. Nutritive value of hay and factors of variation. Energy concentrates (cereal grains and by-products, fats, roots, tubers and by-products). Protein concentrates (protein sources of plant and animal origin). Dietary sources of minerals and vitamins. Feed additives. Technology of manufacturing compound feed.

[Back](#)

Technological Processes and Food Quality (ZOO12381L)

1. Quality: The quality models. The Food Quality. Implementation of a TQM. EEC regulation of food industry (animal products). The sensory requirements of food quality.
2. Microbial growth
3. HACCP -Definition, Objectives. Principles of HACCP. Stages of the implementation of HACCP. Analysis of the implementation of a HACCP system in a food business. Applicable regulation
4. Hygiene in food industry - Food Hygiene. All-purpose and specific hygiene. Applicable regulation (legal controls)
5. Cleaning and disinfection. General Settings. Cleaning and Disinfection (essentials and selection and characteristics of the cleaning and disinfection agent).
6. Classification of Unit Operations-unit operations according to the objective and the transfer phenomena.
7. Application of the food-cold refrigeration and freezing food.
8. Brief approach to technological processes and quality control along the production chain: fish, eggs, fresh meat and processed products, milk and milk products

[Back](#)

Internship in Professional Context (ZOO12376L)

Course contents will be student-specific, as a function of his/her vocational interests and type/activities of the host company.



[Back](#)

Project (ZOO12377L)

1. Concept and models of projects - general scope and specific scope of the agricultural sector.
2. Costs and benefits of projects in the private and social context.
3. Agricultural projects in the framework of the entrepreneurship and agribusiness – enhancers and main factors conditioning.
4. Design and drafting projects for farm business: (i) method of budgets and (ii) introduction to mathematical programming methods.
5. Problems of economic and technical nature associated with the planning of farming enterprises.
6. Feasibility study of projects for agricultural enterprises.

[Back](#)

Ciência e Tecnologia do Leite e Derivados (ZOO12391L)

Introduction to dairy science and technology: milk and dairy products production, consumption, data and trends. National and international regulations for milk processing and products; Milk production and biosynthesis. Dairy chemistry and physics. Factors of variation of milk production and composition. Dairy microbiology. Dairy processing. Utilities: steam, refrigeration and waste handling systems.

Dairy products. Packaging and distribution. Traceability and normalization. Quality control of milk and dairy products

[Back](#)

Science and Technology of Meat and ByProducts (ZOO12392L)

Introduction to the study of the meat, poultry meat. Slaughtering operations of cattle, pig, lamb and poultry. Carcass quality and grading by subjective and objective methods. Meat cuts according Portuguese legislation. Preservation of carcasses and meat by cooling. Chilling and freezing of meat. Chemical composition and structure of muscle. Post-mortem changes in muscle and its conversion into meat. PSE and DFD meats. Meat quality. Chemical and physical characteristics of meat: water holding capacity, colour, and texture. Conditioning of meat. Factors affecting meat quality: Production and technological. Meat packet technology. Processing principles of meat manufacturing. Mechanisms of meat preservation: dry-cured, cooked, smoked and fermented. Modifications during processing. Additives used in meat products and its technological effects. Technological processes of dry-cured products, cooked hams, sausages and emulsion sausages. Meat microbiology.

[Back](#)

Science and Technology of Other Products of Animal Origin (ZOO12393L)

Fish and fish products: Fish as food and raw matter. Quality and quality changes in fresh fish. Processing of fish.

Eggs and egg products: Chemical and physical characterization of the egg and its structure. Quality criteria and functional properties. Factors affecting the quality. Norms for commercialization. Liquid egg products.

Skin, leathers, and wools: skinning, preservation, and transportation of skins. Grading and classification of skins. Definition of leather and proprieties. Shear, inspection, and storage conditions. Grading and classification.

Bee Services/Products: pollination [efficiency improvement and ways of finding pollination efficiency, contracts and risks associated to pollination services, national and international markets] and main bee products [their origin, processing, final characteristics and uses by colonies/beekeepers; strategies, techniques and limits associated to intensified production systems; harvesting, processing, product presentations and markets].



[Back](#)

Animal Production in Tropical and Subtropical Regions (ZOO12380L)

- 1 - Presentation of the tropical world - Socio-economic and ethnographic aspects.
- 2 - Climates, soils and tropical biomes.
- 3 - Animal bioclimatology.
- 4 - Health in the tropics.
- 5 - Tropical grasslands.
- 6 – Supplementation strategies: energy, protein and mineral
- 7 - Silvo-pastoral systems.
- 8 - Agro-ecological zoning.
- 9 - Ruminant species and production systems.
- 10 - Water buffalo.
- 11 - Tripanotolerant breeds.