



## Study Plan

**School:** School of Sciences and Technology

**Degree:** Bachelor

**Course:** Agronomy (cód. 636)

### 1st Year - 1st Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT11377L	Mathematics	Mathematics	6	Semester	156
QUI12208L	Chemistry	Chemistry	6	Semester	156
FIT12210L	Agricultural Systems and Technology	Agronomy Rural Engineering Animal Science	6	Semester	156
ZOO12211L	General Basis for Zootechnics	Animal Science	6	Semester	156
BIO10917L	Cell Biology	Biological Sciences	6	Semester	156

### 1st Year - 2nd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT12212L	Statistics	Mathematics	6	Semester	162
QUI01041L	General Biochemistry	Chemistry	6	Semester	156
FIS00702L	General Physics	Physics	6	Semester	156
BIO00408L	Microbiology	Biological Sciences	6	Semester	156
BIO00407L	Agricultural Botany	Biological Sciences	6	Semester	156

### 2nd Year - 3rd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ERU00247L	Agricultural Hydrology	Agronomy Rural Engineering	6	Semester	156
BIO12215L	Plant Physiology	Biological Sciences	6	Semester	156
GEO00765L	Pedology	Geosciences	6	Semester	156
ERU12216L	Agricultural Mechanization	Rural Engineering	6	Semester	156
ERU12217L	Geomatics	Rural Engineering	6	Semester	156

### 2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
FIT12218L	Soil and Culture Technology	Agronomy	6	Semester	156
ERU00563L	Water Resources and Irrigation	Rural Engineering	6	Semester	156



### 2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
<a href="#">FIT12219L</a>	Plant Genetics and Breeding	Agronomy Biological Sciences	6	Semester	156
<a href="#">FIT12220L</a>	Soil Fertility and Fertilization	Agronomy	6	Semester	156
<a href="#">ECN00499L</a>	Agricultural Economics and Management	Management	6	Semester	156

### 3rd Year - 5th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
<a href="#">FIT12221L</a>	Field Crops	Agronomy	5	Semester	130
<a href="#">FIT12222L</a>	Fruit Crops	Agronomy	5	Semester	130
<a href="#">FIT12249L</a>	Introduction to Plant Protection	Agronomy	5	Semester	130

#### Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
<a href="#">FIT12228L</a>	Production of Aromatic and Medicinal Plants	Agronomy	5	Semester	130
<a href="#">FIT12230L</a>	Postharvest Technology	Agronomy	5	Semester	130
<a href="#">FIT12231L</a>	Wine and Olive Oil Technology	Agronomy	5	Semester	130
<a href="#">FIT12232L</a>	Protected Horticulture	Agronomy Rural Engineering	5	Semester	130
<a href="#">ERU00248L</a>	Greenhouse Technology	Agronomy Rural Engineering	5	Semester	130
<a href="#">ERU00566L</a>	Farm tractors and self-propelled equipment	Rural Engineering	5	Semester	130
<a href="#">ERU00559L</a>	Drainage and Soil and Water Conservation	Rural Engineering	5	Semester	130
<a href="#">FIT12234L</a>	Introduction to Integrated Pest Management	Agronomy	5	Semester	130

### 3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
<a href="#">FIT12223L</a>	Quality and Food Safety	Agronomy	5	Semester	130
<a href="#">FIT12224L</a>	Integrated Production of Agroforestry and Pastoral Systems	Agronomy Rural Engineering Animal Science	5	Semester	130
<a href="#">FIT12225L</a>	Horticulture	Agronomy	5	Semester	130



### 3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
<b>Options</b>					
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
FIT12226L	Plant Biotechnology	Agronomy	5	Semester	130
FIT12227L	Mediterranean Silviculture	Agronomy	5	Semester	130
FIT00227L	Agriculture and Mode of Biologic Production	Agronomy	5	Semester	130
FIT12229L	Viticulture	Agronomy	5	Semester	130
FIT00234L	Olive Production	Agronomy	5	Semester	130
ERU00558L	Training with Farm Equipment	Rural Engineering	5	Semester	130
FIT12233L	Pathology and Entomology of Mediterranean Crops	Agronomy	5	Semester	130
GES00793L	Agricultural Marketing	Management	5	Semester	130
GES00788L	Entrepreneurship and Corporate Innovation	Management	5	Semester	132
ZOO01151L	Monogastric Production Systems	Animal Science	5	Semester	130
ZOO01152L	Ruminant Production Systems	Animal Science	5	Semester	130

### Conditions for obtaining the Degree:

\*\*\* TRANSLATE ME: Para obtenção do grau de licenciado em Agronomia é necessário obter aprovação a 150 ECTS em unidades curriculares obrigatórias e 30 ECTS em unidades curriculares optativas, distribuídas da seguinte forma:

1º Ano

1º Semestre

5 UC Obrigatórias num total de 30 ECTS

2º Semestre

5 UC Obrigatórias num total de 30 ECTS

2º Ano

3º Semestre

5 UC Obrigatórias num total de 30 ECTS

4º Semestre

5 UC Obrigatórias num total de 30 ECTS

3º Ano

5º Semestre

3 UC Obrigatórias num total de 15 ECTS

3 UC Optativas num total de 15 ECTS conforme quadro de optativas (Opção 1)

6º Semestre

3 UC Obrigatória num total de 15 ECTS

3 UC Optativas num total de 15 ECTS conforme quadro de optativas (Opção 2)

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## Program Contents



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### **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.

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### **Chemistry (QUI12208L)**

The composition of matter.

Periodic Table of the Elements. Atomic structure.

The Chemical bond. Ionic bonding. Covalent bonding.

Intermolecular forces.

The properties of Solutions

Chemical thermodynamics

The first law of thermodynamics.

Enthalpy change of chemical transformations. Second law of thermodynamics. Entropy.

Third law of thermodynamics. Gibbs energy

Homogeneous chemical equilibrium

Chemical equilibrium in heterogeneous systems

Solubility equilibria. The formation and dissolution of precipitates.

Equilibria in solutions of Acids and bases

Properties of acids, bases and salts. Buffer solutions. Acid-base titrations

Oxidation-reduction reactions. Electrochemistry

Chemical kinetics



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### **Agricultural Systems and Technology (FIT12210L)**

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 pastures 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 animals 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. Forest systems with and without grazing
  - 7.3. Forest use and hunting management
8. Crop fertilization
9. Crop protection
10. Extensive animal production

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### **General Basis for Zootechnics (ZOO12211L)**

- A. Animal production: 1. Historical evolution. 2. Species used and productive objectives. 3. Different production systems. 5. Animal production in the world, the European Union and Portugal. 6. New goals for animal production.
- B. Animal Anatomy and Physiology: 1. Basic concepts. 2. Notions of the skeletal, nervous and muscular systems of animal species. 3. Exognosis.
- C. Nutrition and Animal Food: 1. Basic concepts and importance. 2. Chemical composition and food analysis. 3. Digestibility, intake and nutritional needs. 4. Formulation techniques. 5. Feeding systems.
- D. Animal Reproduction: 1. Animal reproduction and production. 2. Basic concepts and terminology. 3. Anatomy and physiology of the genital tract in animal species. 4. Reproductive endocrinology. 5. Oestrus cycles. 6. Gestation, parturition and lactation. 7. Auxiliary reproduction techniques.
- E. Genetics and Animal Breeding: 1. Population genetics. 2. Genetic improvement. 3. Selection and crossbreeding.

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### **Cell Biology (BIO10917L)**



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### **Statistics (MAT12212L)**

1. Descriptive Statistics
  2. Basic Probability Notions
  3. Conditional Probability and Independence
  4. Discrete and Continuous Random Variables
  5. The Most Important Families of Discrete and Continuous Probabilities Distributions
  6. Point and Interval Estimation
  7. Hypothesis testing
  8. Analysis of Variance (one-way)
  9. Non-parametric Tests
  10. Simple Linear Regression
- Use of statistical software.

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### **General Biochemistry (QUI01041L)**

Introduction to Biochemistry and its interconnection with the other sciences. The importance of water and inorganic ions in Biosystems. Biological buffer systems. Methods and techniques used in biochemistry. Nomenclature, structure and properties of Biomolecules: carbohydrates, lipids, amino acids, peptides, proteins and nucleic acids. Lipoproteins. Biomembranes. Enzymes and enzyme kinetics. Bioenergetics and bioelectrochemistry. The importance of ATP in metabolism. Anabolism and catabolism. The main metabolic pathways. Introduction to the metabolism of carbohydrate, fat and protein. Integration and metabolic regulation.

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### **General Physics (FIS00702L)**



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### **Microbiology (BIO00408L)**

Theoretical:

1. Historical context and Ubiquity
2. Diversity of the Microbial World
3. Microbial Growth and Death
4. Metabolism
5. Basics of Molecular Microbiology: Microbial genetics, Virology, Immunology
6. Microbes and disease; Normal flora, Pathology, infection and disease, Mechanisms of pathogenicity, Principles of epidemiology
7. Food microbiology: Hygiene and concept of indicator. Processing and storage of food. Foodborne diseases
8. Ecology and environmental microbiology: Soil and water, Biogeochemical cycles, Agricultural applications, Wastewater treatment, Biotechnology applications

Lab Practice:

Aseptic practice

Observation of bacteria, fungi and protists.

Demonstration of Ubiquity

Preparation and sterilization of culture media.

Isolation of pure culture.

Colonial and cellular morphology. Staining methods

Microbial counts

Environmental conditions for growth (pH, temp., O<sub>2</sub>)

Anaerobic Culture

Antibiograms

Microbial spreading simulation

Water and milk analyses

Plant symbiosis.

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### **Agricultural Botany (BIO00407L)**

LECTURES: 1. The seed plant body structural and architectural patterns; 2. Botanical nomenclature; 3. Taxonomy and ecology of plants with agronomic interest; 4. Weed biology and ecology. LAB: 1. Comparative study of vegetative and reproductive organs of seed plants; 2. Identification of flowering plant families specimens.

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### **Agricultural Hydrology (ERU00247L)**



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### **Plant Physiology (BIO12215L)**

WATER RELATIONS: Functions and water movement. Responses to water stress.

TRANSPORT IN PHLOEM: Input and output of metabolites in phloem and transport. Distribution of assimilates.

MINERAL NUTRITION: Essential elements. Criteria of essentiality. Absorption of minerals. Ion movement in roots. Ion transport in membranes.

PHOTOSYNTHESIS: Reactions directly dependent on light. CO<sub>2</sub> reduction. Metabolism C<sub>3</sub>, C<sub>4</sub> and CAM. Photorespiration. Abiotic factors that affect photosynthesis.

RESPIRATION: Pentose phosphate pathway. Abiotic factors that affect respiration.

DEVELOPMENT AND PHYTOHORMONES: Growth and differentiation. Auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroids, salicylic acid and estrigolactonas.

PIGMENTS and Photo-Morphological Characteristics: The pigments of blue light receptors. The family of Phytochrome.

PHOTOMORPHOGENESIS AND FLOWERING

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### **Pedology (GEO00765L)**

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### **Agricultural Mechanization (ERU12216L)**

Tractor and implement: Axle loads. Stability of tractors. Minimise soil damage and improve traffic ability. Safety load diagrams of handling equipment. Engine power; transmission and traction efficiency. Drawbar power. Improve traction efficiency. Matching tractor and implement. Fuel consumption.

Power Transmissions: Cardan shafts; gears; V-belts; chain drives. Kinematics and dynamics of power transmissions. Tractor PTO. Transmission in drills, planters and power harrows.

Hydraulic power: Principles, components and examples of hydraulic power systems in agricultural machinery (a. m.) Tractor linkage control and auxiliary hydraulic system.

Sensors, actuators and IS: Application of electronic sensors and actuators in a. m. Monitors in a. m. Communication of data between tractors and implements. VRT and GPS controlled equipment.

Farm machinery management: Machine performance; Machinery costs. Factors that affect the size of machinery needed. Planting and harvesting date. Work rate. Field days.

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### **Geomatics (ERU12217L)**

1. Computer-Assisted Design (CAD): General Aspects of Technical Drawing, Orthogonal projections and perspectives, dimensioning and scale; Cuts and sections.

2. Digital cartography: Rectangular coordinates, Topographic surveys, Representation of the land in the topographic map, Slope, the line of highest slope, relief forms (valley, top hill), water lines, the top hill lines, watershed delimitation, topographic profiles, the Civil and 3D CAD software and the digital terrain map representation. Physiographic analysis.

3. Global Positioning Systems (GPS): general aspects about the global positioning system; How does a GPS and a DGPS work; Applications.

4. Knowledge integration in the agriculture activity by means of precision agriculture case studies.

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### **Soil and Culture Technology (FIT12218L)**

Crop rotation

Soil tillage

Seeding techniques

Weed control





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### **Water Resources and Irrigation (ERU00563L)**

Planning and managing water resources. Watersheds. Irrigation and the Mediterranean constraints of Portugal. Management of Irrigation and Irrigation Schemes. Soil water balance. Crop water and irrigation requirements. Situations of abundance and deficit: irrigation and water resources management. Irrigation systems: evaluation and classification. Sprinkler irrigation. Drip Irrigation. Surface irrigation. Agricultural drainage. Elements of soil and water conservation. Salinity and quality of irrigation water.

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### **Plant Genetics and Breeding (FIT12219L)**

- Classical Genetics: Mendelian Genetics; Extension of Mendel's laws; Cytoplasmic heredity.
- Cytogenetics: Chromosome structure; Chromosome changes in structure and number; Autosomes and sexual chromosomes
- Molecular Genetics: DNA replication; Gene expression: transcription and translation; Genetic organization in eukaryotes
- Population Genetics: Genotypic and genetic frequencies; Hardy-Weinberg law; Basis of genetic changes.
- Quantitative Genetics: Continuous variation characters; Phenotypic and genotypic variance; Heritability evaluation.
- Superior plants reproduction systems; Plant reproduction and plant breeding conditioning.
- Genetic diversity: Origin centres; Genetic resources; Genetic vulnerability.
- Classical breeding techniques and methodologies; Breeding autogamic plants; Breeding allogamic plants; Breeding plants vegetatively propagated.
- Plant Biotechnology and plant breeding: In vitro culture techniques; Genetically modified organisms; Marker assisted selection.

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### **Soil Fertility and Fertilization (FIT12220L)**

#### **I - SOIL FERTILITY**

1. Soil Fertility.
2. Soil Organic Matter and Soil Fertility.
3. The Soil Reaction.

#### **II - VEGETABLE NUTRIENTS IN THE PLANT AND IN THE SOIL**

1. Classification of plant nutrients (essential and beneficial; main and secondary macronutrients and micronutrients).
2. The Essentiality of Nutrients.
3. Beneficial nutrients.
4. Toxic elements. Heavy metals.
5. Interaction of nutrients. Ionic synergism and antagonism.

#### **III - FERTILIZATION OF SOIL AND CROPS**

1. General aspects of the use of fertilizers and rational fertilization.
2. Fertilization of crops.
- 2.3. Rotation fertilization.
- 2.4. Classification of Fertilizers and Remedies.
- 2.5. Fertilizers.
- 2.6. Use of correctives.
- 2.7 Fertilization and pollution.
- 2.8. Economic profitability of fertilization.
- 2.9. Foliar fertilization and fertigation.
- 2.10. Calculation of the amount of fertilizer to be applied in the fertigation.
3. Crop Fertilization Calculations. Examples and practical cases.



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## **Agricultural Economics and Management (ECN00499L)**

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### **Field Crops (FIT12221L)**

Traditional field crops

Importance of the crops. Study methodology.

Study of the different types of crops: cereals (maize, rice, wheat, barley, oats, rye and triticale); oily crops (sunflower); pulses (chickpea); roots and tubers (sugar beet); stimulant crops (tobacco).

Pasture and forage crops

Importance of the crops and techniques for their establishment. Study of the main annual and perennial grass and legume species with forage and pasture aptitude.

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### **Fruit Crops (FIT12222L)**

1 – Introduction to the morphology, anatomy and reproductive cycle of temperate zone fruit crops. Perennial characteristics.

2- Ecology of temperate zone fruit species.

3 – Floral biology and fruit set

4- Soil and microclimatic factors for fruit crop use.

5- Importance of plant pruning in fruit balance. Principles and practices.

6- Vegetative plant propagation. Principles of rizogenesis. The techniques used in fruit crops, viticulture and olive trees.

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### **Introduction to Plant Protection (FIT12249L)**

Block A. Plant Pathology.

1. Definition of plant disease and types of causing agents.

2. Disease

development and factors that favors them.

3. Symptoms and physiological alterations induced in hosts by pathogens.

4. Morphology and biological properties of the most important pathogens

5. Basic methods to use in the field and in the laboratory for tentative diagnosis and aetiology determination of a given disease.

6. Examples and brief description of diseases of important crops and some means of control.

Block B. Entomology.

1. Study of morphological and biological properties of the main orders of insects.

2. Brief description of some important agricultural pests. Symptoms, biological cycles and control means.

Block C. Plant weeds.

Definition of weed and of plant parasite.

Type of damages caused to agricultural crops.

Botanical classification and biology of most important weeds and useful means of control



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### **Production of Aromatic and Medicinal Plants (FIT12228L)**

I-Anatomy of the most relevant aromatic species in the Mediterranean region

II-Ecology of aromatic plants

III-Propagation

IV-Agricultural practices in aromatic and medicinal plants production

V-Harvest techniques of aromatic plants

VI-Chemical composition of aromatic and medicinal plants

VII- Extraction techniques

VIII-General concepts of integrated pest management of aromatic and medicinal plants

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### **Postharvest Technology (FIT12230L)**

#### **1 - INTRODUCTION**

Relevant economic aspects.

Contextualization of the role of post-harvest in the world. Perishable products in developed countries and in developing countries.

Chemical composition and nutritional value of fruits and vegetables

#### **2 – PHYSIOLOGICAL BASES AND CONCEPTS IN POST-HARVEST.**

Metabolism of post-harvest; ripening; respiration.

Climacteric and non climacteric fruits.

Ethylene production.

#### **3 - HARVESTING**

Optimum time of harvest, harvesting operations.

Maturation Indices. Quality assessment.

Quality standards.

#### **4 – STORAGE USING LOW TEMPERATURES**

Effect of different atmospheres on the metabolism of the products

Modified atmosphere.

Packaging films: selective permeability. Edible films.

Minimally processed products.

Controlled atmosphere.

Metabolic effects.

Packaging and transport.

Specific cases of post-harvest: fruits, vegetables and ornamentals

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### **Wine and Olive Oil Technology (FIT12231L)**

The grapes ripening process. Chemical composition of grapes and wine. The whites, roses and reds wines technologies. Corrections to be made in musts and wines composition. The alcoholic fermentation and malolactic fermentation. Clarification and stabilization treatments for wines. The maturation and aging of the wine. The use of wood in oenology. Analysis of grapes and wines.

Aspects of olive oil production. Agronomic techniques that influence the quality of the olive oil.

Composition of olive and virgin olive oil. Olive oil technology: harvesting, cleaning, transportation, reception, cleaning and preservation of olives. Olive paste preparation: grinding and malaxation. Adjuvants for extraction. Solid / liquid extraction: pressure, filtration and centrifugation (2 and 3 phases). Liquid / liquid separation. Storage and preservation. Packaging. Sub-products. Effluent treatment. Classification and characteristics of virgin oils.



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### **Protected Horticulture (FIT12232L)**

Economic importance of vegetal production in Portugal and in world

Forced crops in Mediterranean area

Concepts and definitions

Theoretical and technical aspects of forced crops.

Effects of the growing environment on plant growth, development and fruit yield

Carbon dioxide fertilization

Means of protection (e.g. mulching, greenhouses, tunnels, etc.).

Technology of production of major vegetable crops (e.g. tomato, melon, lettuce, roses, etc.)

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### **Greenhouse Technology (ERU00248L)**

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### **Farm tractors and self-propelled equipment (ERU00566L)**

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### **Drainage and Soil and Water Conservation (ERU00559L)**

1. Soil degradation and soil erosion

Objectives of soil conservation

Geological erosion and induced erosion

Agents of degradation and erosion

2. Soil and water degradation

Soil aggregates stability

Water and soil solution quality

Infiltration, accumulation and salt leaching, crust formation

Salt leaching and water quality

3. Soil water dynamics and soil drainage

Drainage types

Drainage systems and technologies

4. Induced erosion and its control

Soil degradation, sediment transport and deposition

Effects of soil crust formation

Infiltration enhancement and runoff control. Soil crust control

5. Soil loss estimation

Soil loss modeling

Identification of areas prone to sediment loss; Tolerance to soil loss

6. Soil reclamation

Terrain organization

Induced changes in the soil characteristics



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### **Introduction to Integrated Pest Management (FIT12234L)**

#### Module1.

- 1- The concepts on Integrated Pest Management. Methods for damage risk estimating. Quantitative and qualitative pest risk evaluation. Economic threshold;
- 2- Preventive control Measures. Preventive agricultural protection against pest and diseases.
- 3- Classification, selection and use of Direct Control Methods
- 4- The ways of biological control. The main beneficial organisms available against pests, diseases and weeds. Commercial beneficial organisms. Methods on biological control. Basic notions on biopesticides, its production and use and application.

#### Module 2.

- 1- Chemical control. The pesticides for agricultural use. Their application, and equipment. Pesticide mixtures;
- 2- Pesticide selection process. Impact on beneficial organisms.
- 3- Classification of pesticides by mode of action, family chemistry and aim
- 4- Pesticide resistance.
- 5- Concepts on Toxicology.

#### Module 3.

- 1- IPM application. Practical cases related to the major groups of mediterranean pests and diseases.

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### **Quality and Food Safety (FIT12223L)**

#### Food Safety

Quality concept, quality systems and quality management.

Toxicity of natural compounds in food. Toxicology of pesticides in food.

Food contamination. Physical, microbiological, chemical and biochemical food degradation. Food microbiology. The use of starter cultures. Food additives. Sanitation in food industry. Hazard Analysis and Critical Control Points (HACCP).

#### Food Control Quality

Statistical quality control. Sampling plans. Control graphics. Sensorial evaluation.

#### Post Harvest

Ripening physiology; respiratory process. Deterioration of fresh fruits and vegetables. Harvest methods and mechanical damages. Evaluation of quality.

Packaging, storage and commercial chain. Minimal processed fruits and vegetables.

#### Storage and cooling

Room and equipment management

Cooling and freezing methods and equipments.

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### **Integrated Production of Agroforestry and Pastoral Systems (FIT12224L)**

Introduction; Definitions and concepts; Guidelines for the elaboration of the group work;

Structural analyse of the rural space & Causes of the differentiation of rural areas;

Productive processes in agro-forestry-pastoral systems;

Classification of agro-forestry-pastoral resources and strategies for their conservation;

Introduction to the structure and functioning of trees and forests;

Forest production systems;

Historical evolution of agriculture; Classification of Land Use Systems;

Land Use Systems (at global and national level);

Analysis of agro-forestry-pastoral systems in terms of their alpha, beta, gamma and landscape diversity;

Agroforestry-environmental measures and the conservation of habitats;

Principles of the management of forestry resources;

Planning of forestry activities.



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## **Horticulture (FIT12225L)**

### **I OVERVIEW**

Global and national perspective. Horticultural systems. Horticultural regions.

Zoning of Portugal and abiotic.

### **II PRODUCTION TECHNOLOGIES**

Rotations.

Protected Horticulture: techniques, materials and facilities. Greenhouses. Semi- forcing methods.

Use of growth regulators.

Fertilizing and watering

Soil Less Culture (hydroponics). Substrates and nutrient solutions.

### **III PLANT PROPAGATION**

Vegetative propagation. Grafting.

Seminal propagation. Evaluation of seed quality. Germination assays.

Plants preparation.

### **IV HORTICULTURAL CROPS**

Study of edible crops: Cabbages, tomatoes, potatoes, strawberries, green beans, other.

Economic and /or cultural interest. Physiological aspects. Production aspects. Quality aspects, postharvest and marketing.

Study of ornamental crops: Chrysanthemum, gladiolus, tulip, other.

Economic aspects. Determining physiological aspects. Propagation. Production aspects. Post-harvest and marketing.

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## **Plant Biotechnology (FIT12226L)**

- Plant Biotechnology: Theoretical definition, main proposes and basic concepts.

- Laboratory infrastructures and equipment: Special details of a plant biotechnology laboratory; Main equipment and its use.

- In vitro culture techniques: Micropropagation; Haploidization; Somatic Embryogenesis; Suspension Cells Culture; Protoplast Culture.

- Genetic Transformation: Genetically Modified Organisms; Notion of genetically modified organism; Gene transfer methods; Selection of transformed plants; Stability of the transferred gene; Ethical aspects of the recombinant DNA technique.

- Genetic and Molecular Markers; Kinds of markers and its use; Singularity of the DNA-markers.

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## **Mediterranean Silviculture (FIT12227L)**

Brief historical remarks of the evolution of Portuguese forest.

Actual state of forest sub sector in Portugal

The role of the forest in the ecological, economic and social development

Fundaments of tree and forest growth

The concept of Multiresource Forest Management

Measuring trees and forests

Objectives of silvicultural practices

Intermediate cuttings

Thinning concepts

Improvement and salvage cuttings, pruning

Ecology of natural regeneration and the role of natural fire

Plantation methods and nurseries

Portugal forest production systems (Quercus suber, Quercus rotundifolia, pinus pinea, pinus pinaster, Eucalyptus globulus)



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### **Agriculture and Mode of Biologic Production (FIT00227L)**

Introduction to sustainable agriculture. General principles of organic agriculture. Other alternative agriculture movements.

Legal framework. International standards and guidelines. Certification and accreditation schemes.

Soil fertility management in organic agriculture. Biomass recycling.

Organic pest, diseases and weed management. Pest prevention and control, techniques for direct control of insects, fungi, bacteria, viruses, nematodes and weed control techniques.

Organic agriculture and ecosystem services. The concept of Functional AgroBiodiversity.

Mediterranean organic commodities production.

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### **Viticulture (FIT12229L)**

1 - Introduction: Economic importance of viticulture and grape producing regions

2 - Systematic and morphology:

Ampelideas Family. External morphology of branches , leaves, buds and inflorescences. Stem and root apex anatomy.

3 - Physiology and development of the vine

Vegetative development: dormancy and shoot growth

Reproductive development: Fertility and fertility rates. Flowering and fruit set. Berry shatter and other physiological problems. Berry growth and development . Environmental and cultural practices. Quality parameters and quality evaluation.

4 -Supports for vines: study of the vine microclimate and the vines responses to pruning -Discussion about the major important training systems.

5 - Ecology of the vine: Study of particular aspects of soil and climate important to define the grape production areas . Climate-indices.-Soil importance.-The concept of "Terroir". Quality potential.

6 -The production of table grapes and raisins:

-Main varieties and cultural practices.

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### **Olive Production (FIT00234L)**

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### **Training with Farm Equipment (ERU00558L)**

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### **Pathology and Entomology of Mediterranean Crops (FIT12233L)**

Plant Pathology 1 Study of specific key diseases affecting most important crops in the country, caused by: 'Fungus-like organisms', fungi, bacteria, phytoplasmas, virus and weeds. Symptoms, biological cycles and means of control effective. 2 Methods for diagnosis of plant pathogens and applications. 4. Programs of Phytosanitary Certification.

Entomology 1 Studies on morphology, physiology and biology of key pests of Mediterranean crops,

caused by mites and insects. 2 Relevant factors in the development and distribution of pests. 3

Correlation among feeding and reproductive habits of pests and their respective deleterious effects on hosts.

Team work assignment of the crops to students working as a team, that will follow the biological cycle of the crop, record the symptoms, collect samples of symptomatic tissues/organs, list possible causal agents, bring to the lab for detailed observation, isolation and diagnosis. All these steps will be discussed and closely supervised by a professor



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**Agricultural Marketing (GES00793L)**

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**Entrepreneurship and Corporate Innovation (GES00788L)**





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## **Monogastric Production Systems (ZOO01151L)**

### **SWINE PRODUCTION**

Introduction to pig production: Origin and domestication of pigs. Types and swine breeds. Evolution of swine production. Swine production in the world.

Pig Reproduction: Boars reproductive performance. Artificial Insemination. Reproductive cycle of the sow: Puberty, pregnancy, parturition, lactation.

Productivity: expression and calculation. Factors affecting productivity.

Piglets management: Care and management of piglets at farrowing time. Characteristics of the newborn piglet. Physiological particularities of piglet. Weaning and post-weaning: Management practices.

Growing pigs management: Factors affecting growth and development of pig. Carcass and meat quality. Management practices.

Nutrition and feeding of pig: Feeds. Nutrient requirements. Feeding programs in intensive systems: boars, gilts, pregnancy and lactation sows, piglets, growing and finishing pigs.

Pig production and environment: Linkages between pig production and the environment. Technologies and management practices to reduce the environmental impacts. Waste management.

Alternative pig production systems: Historical background. General characteristics of alternative systems of pig production.

Alentejano and Bísaro pig breeds production. Out-door pig production. Iberian pig production. Free range pig production.

Organic pig production.

Technical-economic analysis: Technical and economic indicators. Use of computer programs in technical-economic analysis of intensive and extensive pig farms.

### **POULTRY PRODUCTION**

Introduction to poultry production: Origin and domestication of poultry. Types, breeds and strains of poultry. Poultry production in the world.

General aspects of poultry production: Organization of poultry industry. Breeding and selection in egg and meat poultry. Poultry products.

Nutrition and feeding of poultry. Feeds. Nutrient requirements. Feeding programs for broilers and layers.

Management of layers: Breeds and strains. Production systems. Pullet growing and layers. Animal housing, environmental comfort, lighting programs. Technologies and management practices. Egg quality.

Management of broilers: Breeds and strains. Characterization of production systems. Animal housing, environmental comfort, lighting programs. Technologies and management practices.

Alternative poultry production systems.

### **RABBIT PRODUCTION**

Introduction to rabbit production: Breeds of rabbits. Classification of rabbits. Uses of rabbits. Rabbits production in the world, in E.U. and in Portugal.

Reproduction of rabbits: Physiology of reproduction. Reproductive cycle of the doe. Reproductive management practices.

Nutrition and feeding of rabbits: Feeds. Nutrient requirements. Feeding programs.

Production systems of rabbit meat.

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## **Ruminant Production Systems (ZOO01152L)**