

Bachelor in Organic Agriculture | Courses syllabus

1st curricular year

Introdução à Agricultura Biológica / Introduction to Organic Farming (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1 Understand the concept and the importance of organic farming (OF) in Portugal, in Europe and in the world; 2. Distinguish the different streams of Sustainable Agriculture (SA) and meet the obligations associated with each differences. 3- Maintain and preserve existing ecosystems and promote the maintenance of the balance of the recommended farming system. 4- Have relevant knowledge of agricultural technology for the fertilization of the land mobilization and composting. 5- Have relevant knowledge of agricultural technology for crop protection in organic farming (OF). 6- Know legislation rules on livestock in OF and the specific technologies of different species as well as preventive and curative therapies recommended in OF.

Syllabus:

The Concept of OF, its importance, rules and existing legislation; Notions of Traditional and Conventional Agriculture and differences of Sustainable Agriculture (Biodynamic, Organic, Natural, Ecological and Permaculture) and Integrated Production

Ecosystem concept and advantage in the preservation of plant and animal species for its preservation. The environmental advantages in implementing the existence of ponds / lakes and hedge maintenance "Trees and shrub barriers" and "floral massive" along lines water and in the vicinity of the farm and its role in the maintenance of the agroforestry system and plain, Holistic knowledge, technological and scientific as to tillage, fertilization and maintenance of soil; The development of technology, evolution and maintenance of compost; The control of pests, diseases and spontaneous, a preventive and curative Understanding the specific legislation and livestock technologies, under the rules of OF.

Bibliography:

FERREIRA, J.C. et al (1998). Manual de agricultura biológico- Fertilização e protecção das plantas para uma agricultura sustentável. AGROBIO, Lisboa, 431 p. GUET, G. (1993). Agriculture biologique méditerranéenne - Guide pratique à usage professionnel. Graphot, Saint-Paul-Châteaux, 520 p.
LAMPKIN, N. (1990). Organic Farming. Farming Press Books, Ipswich, 701 p.
MORENO, J.L. (1996). La materia orgánica en los agrosistemas. Ministério de Agricultura Pesca y Alimentation & Ediciones Mundi-Prensa, Madrid, 174 p. SOLTNER, D. (1989). Les bases de la production végétale. Collection Sciences et Techniques Agricoles, 17ª edición, Angers, 468 p.
CONFEDERAÇÃO AGRICULTORES DE PORTUGAL Recomendações de bem-estar animal / Confederação dos Agricultores de Portugal. Lisboa: CAP: DGV, 2006 FRASER A. F. Farm animal behaviour and welfare / A. F. Fraser. 3th ed. London: Baillière Tindall, 1990.
Manipulations et interventions sur le bétail. Bovins Ovins et caprins. Tome 1e 2. INRA. Ed Foucher.1987.

Biologia I / Biology I (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Introduction to the diversity of living beings; cell structure and physiology, hereditability mechanisms, plant histology, systematics.

Syllabus:

1. Cytology and methods to study cells; 2. Systematics; 3. Eukaryotic and prokaryotic cells; 4. Hereditability and evolutions; 5. Histology and plant anatomy; 6. Major groups of microorganisms: viruses, bacteria, fungi, algae, protozoans.

Bibliography:

Azevedo, C, Sunkel, C. Biologia Celular e Molecular. 5ª ed., Lidel - Edições Técnicas, Lisboa, 629 p. 2012.
Junqueira, L.C., Carneiro, J. Histologia Básica. 11ª ed., Guanabara Koogan, Rio de Janeiro, 524p., 2008.
Madigan, M.T. Martinko, J.M., Bender, K., Buckley, D.P., Stahl, D.A. Brock Biology of Microorganisms. 13ª ed., Benjamin Cummings, Pearson, 2012.
Pelczar, M., Chan, E., Krieg, N. Microbiology: Concepts and Applications. McGraw-Hill Book Company. Nova Iorque, 1993.
Raven, P.H., Evert, R.F., Eichhorn, S.E. Biologia Vegetal. 7a ed., Guanabara Koogan. Rio de Janeiro, 2007.
Sadava, D.E., Hillis, D.M., Heller, H.C., Berenbaum, M. Life: The Science of Biology. 10a ed., Publisher, W.H Freeman, Massachusetts, 2014.

Língua Inglesa e Comunicação / English Language and Communication Skills (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Uses the English language in oral and written expression as well as in reading and listening comprehension; Conducts bibliographic research on specific topics; Recognizes the specifics of scientific-technical discourse; Develops the ability to communicate in an academic context.

Syllabus:

1) Review of general vocabulary and main grammatical structures of the English language. 2) Bibliographic research on specific topics: - Writing texts of varying levels of difficulty; 3) The concept of English for Specific Purposes: the language at the service of the subject it conveys: - The technical-scientific discourse: characteristics and application; -Types of scientific-technical texts: laboratory protocol, technical report, research paper, critical review, scientific poster, monograph, etc.; - Exercises in reading and analysis of various types of texts; 4. Communication practices in an academic context: - The fundamentals of oral presentations; - Research: concept, types and procedures for locating and retrieving written and online information; - Structuring of reports and technical-scientific posters.

Bibliography:

Answers.com – Online Dictionary, Encyclopedia and much more. URL:http://www.answers.com_.
BASTOS, Lilia da Rocha [et al.] – Manual para a elaboração de projetos e relatórios de pesquisa, teses, dissertações e monografias. 4ª ed. rev. e ampl. Rio de Janeiro: Guanabara Koogan, 1995.
DUDLEY-EVANS, T.; ST. JOHN, M. - Developments in English for Specific Purposes. Cambridge: Cambridge University Press, 1998 [2011].
MURPHY, Raymond – English Grammar in Use. Cambridge: Cambridge University Press, 2004.
NP 405-1.1994, Informação e documentação - Referências bibliográficas: documentos impressos. Instituto Português da Qualidade (IPQ).
NP 405-3.2000, Informação e documentação – Referências bibliográficas: documentos não publicados. IPQ.
NP405.4.2002, Informação e documentação – Referências bibliográficas: documentos electrónicos. IPQ.
SINCLAIR, J. M. – Collins English Dictionary. Millennium Edition. Glasgow: Harper Collins, 1998.

Métodos numéricos e programação / Numerical Methods and Programming (1º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Knows the concepts of both matrix and determinant and their applications for solving linear systems; 2. Uses numerical analysis techniques, to find zeros of functions, uses polynomial interpolation and numerical integration; 3. Uses structured programming and object-oriented languages; 4. Uses the main office software tools.

Syllabus:

1.1. Matrices; 1.2. Determinants; 1.3. Linear systems. 2.1. Zeros of functions; 2.2. Polynomial interpolation; 2.3. Numerical integration. 3.1. Programming functions; 3.2. Programming procedures. 4.1. Word processing; 4.2. Spreadsheet; 4.3 Other information technology.

Bibliography:

Magalhães, Luís T. - Álgebra Linear como Introdução à Matemática Aplicada. Texto Editora, 1996.
Ruggiero, M.; Lopes, Vera Lúcia - Cálculo Numérico Aspectos Teóricos e Computacionais. McGraw-Hill, 1988.
Strang, Gilbert - Linear Algebra and its Applications. Harcourt Brace Jovanovich, Inc., 1988.

Química e Bioquímica I / Chemistry and Biochemistry I (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

To know: the properties of the solutions; laws of the Chemical Equilibrium considering the different types of equilibrium: acid base, oxidation-reduction, poorly soluble salts and complexation; structure of the main classes of organic compounds; the nomenclature of the main classes of organic compounds; the physical properties of the organic compounds; the main functional groups of the organic biomolecules

Syllabus:

Interaction forces between molecules and sites of action. Properties of the solutions. Chemical Equilibrium: acid-base, oxidation-reduction, poorly soluble salts and complexation. Structure, nomenclature and physical properties of the organic compounds. Functional groups of the organic biomolecules

Bybliography:

Atkins, P. W; Beran, J.A. - General Chemistry, Sci. Am. Books, 1992
Allinger, N.L.; Stevens, C.L. - Organic Chemistry, Worth Publishers, Inc. 1998
Stryer, L. - Biochemistry, The Molecular Basis of Cell Structure and Function, Worth Publishers, 1979
Vidal, M.M.; Filipe O.; Costa, M.C. - Química no laboratório, 100Luz, 2ª Edição, 2010

Geologia e Climatologia / Geology and Climatology (1^o semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Competency 1 - a) Knowing the internal structure of the Earth, the phenomena associated with it and the implications for plate tectonics, earthquakes, and in the type of volcanoes; b) Know the major types of rocks, their genesis, composition and aspects related to weathering; c) Identify the different types of relief and orogenesis. Competency 2 - a) Realize variation of incident solar radiation throughout the year and according to latitude, the radiation balance and energy balance of the surface; b) Know the ways of measuring climatic elements, the ratio of the average values of climatic elements and extremes with climate factors that gave rise to the various climates at a globally scale; c) Prepare the soil water balance using methods of Thornthwaite and Matter.

Syllabus:

Geologic process- internal geodynamic processes, theory of continental drift, plate tectonics; volcanism; external geodynamics; Geomorphology - rock types, genesis and composition. Variation of incident solar radiation throughout the year and according to latitude; Radiation balance and energy balance of the surface; Measurement of climatic elements; Interaction of climate with average and extreme elements of the weather factors that gave rise; The second soil water balance methodology Thornthwaite and Matter. Climates worldwide.

Bibliography:

CARVALHO, A.. M. G.1996. Morfogénese e Sedimentogénese, Universidade Aberta, Lisboa. CARVALHO, A. M. G. 1997. Petrogénese e Orogénese, Universidade Aberta, Lisboa. CARVALHO, A. M. G. 2008. Geologia Sedimentar. Editora Âncora, 2^a Edição.
CARVALHO, A. M. G. 2008. Introdução ao Estudo dos Minerais. Editora Âncora, 2^a Edição, 2008.
COSTA, J. B. 1985. Estudo e Classificação das Rochas por Exame Macroscópico, Fundação Calouste Gulbenkian, (6^aed.), Lisboa. CUNHA, L.V. 1982. As secas. Comissão Nacional do Ambiente, Lisboa.
FEIO, M. 1991. Clima e Agricultura. Ministério da Agricultura, Pescas e Alimentação. Lisboa. MONTGOMERY, C. W. 1997. Environmental Geology, McGraw Hill.
NUNES, M.E e FERREIRA, A. 2003. Elementos de Apoio à Disciplina de Climatologia. ESAC. PEIXOTO, J.P. 1981. A Radiação Solar e o Ambiente. Comissão Nacional do Ambiente, Lisboa. RETALLACK, J.B. 1996. Meteorologia. Instituto Nacional de Meteorologia e Geofísica, Lisboa.

Fisiologia Vegetal / Plant Physiology (2^o semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1 -Knows the importance of water and its movement in the continuum soil - plant - atmosphere;2 -Understands the mechanisms involved in the acquisition, circulation and use of mineral elements by plants; 3 -Knows the processes used by plants to store light energy into organic compounds of high energy; 4 - Quantifies the active photosynthetic energy and the ability of plants to fix CO₂ from the atmosphere; 5 - The mechanism of translocation; 6 - Knows the nature and characteristics of plant hormones and the role in the regulation of plant development; 7 - Knows the basic principles of plant organs response to external stimulus; 8 - Knows what the determinants of vegetation distribution on the surface of the Earth.

Syllabus:

Module 1: 1- Main functions of water plants; 2- Water potential and its components; 3- Movement in soil-water-plant-atmosphere system. 4- Physiology of the stomatal; 5- Structural and environmental factors that affect transpiration rate; 6 - Basic principles of mineral nutrition of plants; 7 - Structural and metabolic functions of the major nutrients
Module 2: 1- Structure of the photosynthetic system; 2-Photochemical reactions of photosynthesis; 3-Reduction in photosynthetic carbon dioxide and alternative ways of fixing CO₂; 4 - Anatomy of the leaves of C₃ plants , C₄ , CAM and your metabolism; 5 - Role of photorespiration and respiration; 6 -Synthesis and regulation of photo assimilate; 7- Major regulatory substances and their physiological effects on plant development; 8- Effect of hormonal control in the germination of seeds and latency , senescence , abscission and home plants.

Bibliography:

Azcon-Bieto, J.; Talon, M. – Fisiologia y Bioquímica Vegetal. Nova Iorque. Interamericana, McGraw Hill, 1993.
Ferreil, M. – Fisiologia Vegetal. São Paulo. EDUSP, 1986.
Martinez, F. G. – Elementos de Fisiologia Vegetal. Madrid. Ed. Mundi, Prensa. 1995.
Salisbury, F.; Ross, C. – Plant Physiology (4.^a ed.). California. Wadsworth Pub. Comp, 1992.
Taiz, L.; Zeiger, E. – Plant Physiology (2.^a ed.). Sunderland. Sinauer Associates, 2002.
Astro, P.; Kluge, R.; Peres, L. - Manual de Fisiologia Vegetal. Editora Agronómica Ceres.2005.

Biologia II / Biology II (2^o semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Identification of microorganisms; microbial diversity; 2. Identification of plants; plant diversity; main characteristics of the major taxonomic groups.

Syllabus:

Bases of microbial taxonomy and systematics; general methods in microbiology; methods for microbial identification; microbial nutrition and growth; applied microbiology. Introduction to botany; evolution from green algae to evolved Magnoliophyta. Adaptations of terrestrial plants. Plant systematics: botanical characterization of the main families with agricultural interest. External plant morphology.

Bibliography:

FERREIRA W.F.C.; Sousa J.C.F.; Lima N. Microbiologia. ed. Lidel, Lisboa. 622 pp. ISBN: 978-972-757-515-2. 2010.
FRANCO J.A.; Afonso M.L.R. Nova Flora de Portugal (Continente e Açores). Escolar Editora. Lisboa. Portugal. 1971 - 2003.
IZCO J. et al. Botânica. 2ª Edição McGraw-Hill- Interamericana de España. S.AU. 1998.
LIDON F.J.C.; Gomes H.P., Abrantes A.C.S. Anatomia e morfologia externa das plantas superiores. Lidel. Lisboa. 2001.
PELCZAR M., Chan E.; Krieg N. Microbiology: Concepts and Applications. McGraw-Hill Book Company. New York. 1993.
RAVEN, et al. Biology of Plants. 6.nd Edition. W.H. Freeman and Company. Nova Iorque. 1999.

Inglês Técnico e Comunicação / Technical English and Communication skills (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1) Applies the syntax and rhetoric of scientific discourse in the production of technical written and oral texts: Prepares thematic glossaries; Uses technical vocabulary. 2) Masters the lexicon of specific terminologies: Develops techniques for characterization, classification and definition; - Writes abstracts and summaries. 3) Uses advanced techniques of communication to produce technical-scientific works in audiovisual media: Designs and prepares technical-scientific papers and reports using quotes; Masters oral presentations. 4) Collects, selects, analyzes and produces information: Applies techniques of written and oral communication for the world of work (curriculum, application and presentation letters, etc.).

Syllabus:

1) The technical-scientific discourse: characteristics and application: - Types of scientific-technical texts: laboratory protocol, technical report, research paper, critical review, scientific poster, monograph, etc.; - Reading and listening comprehension of texts in the field of Organic Farming; - Elaboration of thematic glossaries. 2) Expansion of the lexicon of specific terminologies: - Discursive features and linguistic patterns present in these types of texts: descriptions, definitions, classifications, comparisons, instructions, etc.; - Review of academic vocabulary for these operations. 3) Specialized written and oral production in the context of Food Science and Technology: - Using advanced techniques of communication. 4) Practice collection, selection, analysis and production of information: - Development of curriculum, application and presentation letters, and procedures for the job interview.

Bibliography:

Answers.com – Online Dictionary, Encyclopedia and much more. Disponível em WWW:URL:<http://www.answers.com>
BASTOS, Lilia da Rocha [et al.] – Manual para a elaboração de projetos e relatórios de pesquisa, teses, dissertações e monografias. 4ª ed. rev. e ampl. Rio de Janeiro: Guanabara Koogan, 1995.
DUDLEY-EVANS, T.; ST. JOHN, M. - Developments in English for Specific Purposes. Cambridge: Cambridge University Press, 1998 [2011].
MURPHY, Raymond – English Grammar in Use. Cambridge: Cambridge University Press, 2004.
NP 405-1.1994, Informação e documentação - Referências bibliográficas: documentos impressos. Instituto Português da Qualidade.
NP 405-3.2000, Informação e documentação – Referências bibliográficas: documentos não publicados. IPQ.
NP405.4.2002, Informação e documentação – Referências bibliográficas: documentos electrónicos. IPQ.
SINCLAIR, J. M. – Collins English Dictionary. Millennium Edition. Glasgow: Harper Collins, 1998.

Análise Matemática / Mathematical analysis (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Masters the basic concepts of differential and integral calculus and its applications; 2. Identifies and solves 1st order differential equations; 3. Knows the concepts of both matrix and determinant and their applications for solving linear systems

Syllabus:

1.1. derivatives; 1.2. antiderivative; 1.3. definite integrals; 1.4. areas and volumes by applying definite integrals; 1.5. improper integrals; 2.1. differential equations of separable variables; 2.2. linear differential equations; 2.3. Bernoulli differential equations.

Bybliography:

Foulis, D.; Munem, M.- O Cálculo. Guanabara Dois, S.A.:Volume I, Cop. 1978.
Leithold - O Cálculo Com Geometria Analítica. Dinalivro, 1994.
Ross, S. - Differential Equations. McGraw-Hill, 1984.
Saraiva, M.A; Silva, M. - Primitivação. Edições ASA, 1995.

Química e Bioquímica II / Chemistry and Biochemistry II (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

The student knows the reactivity of the main functional groups of the organic compounds; Knows the structure of the main classes of natural compounds; - Understands the metabolism of carbohydrates, lipids and proteins; Understands the mechanism of the catalytic activity of the enzymes

Syllabus:

Reactions of the main classes of organic compounds. Structure and properties of the main classes of natural compounds. Biological functions of carbohydrates, lipids and proteins. Metabolism of carbohydrates, lipids and proteins. General structure of enzymes and their action mechanism.

Bibliography:

Lehninger - Principles of Biochemistry, Worth Publishers inc, 1987
Morison, R.; Boyd, R. - Química Orgânica, Fundação Calouste Gulbenkian, 1998
Metzler, D. E. - Biochemistry: The Chemical Reactions of Living Cells, Academic Press, 1977

Pedologia / Pedology (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

It is intended that the student acquire the following competencies to perform successfully the course: 1) Identify the constituents and properties of soils and their respective effects on soil quality and agricultural production; 2) Identify the factors and processes responsible for the formation and differentiation of natural or soils subject to agricultural use; 3) Understands the processes of soil degradation and practices that contribute to the conservation and improvement of soil quality.

Syllabus:

Module I: mineral and organic constituents from the ground; Mineralogy soil; Organic matter and the carbon cycle; Environmental factors determining the physical, chemical and biological soil properties; Effects of incorporation and soil properties on soil quality and plant productivity. 2) soil water: content distribution and energy state of soil water; Retention and movement of solutes in saturated and unsaturated soil; Availability of water to plants; The soil and the hydrologic cycle. 3) Functions of Soil in terrestrial ecosystems. Module II: Factors of soil formation and their interactions; Processes of soil formation and evolution; Differentiation and nomenclature of horizons; Diagnostic horizons; Main soil types. Types of erosion, wind and water; factors and processes; methods to combat erosion and soil conservation practices; methodologies to estimate soil loss: the RUSLE equation.

Bibliography:

BONNEAU, M., SOUCHIER, B. - Constituants et Propriétés du Sol. Masson, Paris, 1994.
BRADY, N.C.; WEIL, R.R. - The Nature and Properties of Soils. 13ªEd. Mac Millan Pearson Education Inc. New Jersey, 2002.
CARDOSO, J. C., BESSA, M. T., MARADO M. B. - Carta de Solos de Portugal. (1 : 1 000 000). Agronomia Lusitana 33 : 481 – 602, 1973. COSTA, J. B. - Caracterização e Constituição do Solo. 7ªEd., F.C.G., Lisboa, 2004.
FOTH, H. D. - Fundamentals of Soil Science. John Wiley and Sons, 1978.
HILLEL, D. - Environmental Soil Physics. Academic Press. New York, 1998.
GARDINER, D. T., MILLER, R. W. - Soils in our Environment. Ed.Pearson.New Jersey, 2004.
RICARDO, R. P. - Génese e Evolução dos Solos. ISA, Lisboa, 1969.
TAM, K. H.- Environmental Soil Science. Marcel Dekker, Inc. New York, 1994.
WIGLEY, T.M.L., SCHIMMEL, D. S. – The Carbon Cycle.Cambridge University.

2nd curricular year

Economia e Sociologia / Economy and Sociology (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. To understand the networks of relationships among economic actors; 2. To understand the mechanisms of price formation in a market economy; 3. To analyze the evolution of Portuguese society according to various perspectives; 4. To apply methods and techniques of social science research.

Syllabus:

1. Fundamental economic problems; 2. Circuit economic and economic agents; 3. The supply and demand of goods and services; 4. General concepts of economics of production; 5. Indicators for assessing the behavior of an economy; 6.

Economic policy; 7. The regulation of the economy; 8. Basic concepts of Sociology; 9. Planning and research strategies in Social Sciences.

Bibliography:

ANDRADE, J.– Introdução à Economia. Lisboa: Minerva, 1998.
FRANK, R. e BERNANKE, B. – Princípios de Economia. Lisboa: Mc Graw Hill, 2003. MOREIRA, C. - Planeamento e Estratégias da Investigação Social: Lisboa: ISCSP, 1994
SAMUELSON, P. e NORDHAUS, W. – Economia. 16^a ed. Lisboa: Mc Graw Hill, 1999.
SILVA, A.S. e PINTO, J.M. - Metodologia das Ciências Sociais. Porto: Edições Afrontamento, 1986.

Fertilidade do Solo e Nutrição Vegetal / Soil Fertility and Plant Nutrition (1^o semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. To know the behavior of nutrients in the soil-plant- atmosphere system and the importance of physical, chemical and biological soil fertility; 2. Implement procedures for assessing soil fertility and plant nutritional status, namely: a) Carry out sampling of soil and plant material; b) Know the methodologies used in chemical analyzes of soils and plants; c) Interpret the results of the analyzes; 3. Carry out a proper fertilization plan to organic production.

Syllabus:

I. Dynamics of plant nutrients in soil and plant. Characterization of physical, chemical and biological soil fertility: physical, chemical and biological processes and reactions inherent to each process; II. Use of diagnostic methods: Sampling of soil and plant material and methods of analyzes of soil and plant material. Interpretation of the results obtained in the analytical determinations; III. Characteristics of fertilizers in general. Appropriate to the organic fertilizer production. Principles used in the general recommendations of fertilization and conversion to organic production. Adequate fertilization plans to organic standards.

Bibliography:

MALAVOLTA, E. 1994 Fertilizantes e seu impacto ambiental: micronutrientes e metais pesados, mitos, mistificações e fatos. São Paulo: Produquímica, 153p.
MARSCHNER, H. 1986. Mineral Nutrition in Higher Plants. Academic Press, London.
MENGEL, K., KIRKBY, E., KOSEGARTEN, H. AND APPEL T. 2001. Principles of Plant Nutrition. 5th Ed. International Potash Institute, Berna. Kluwer Academic Publishers, Netherlands.
SANTOS, J.Q. 1996. O Uso dos Fertilizantes e Perspectivas da sua Evolução. Palestra proferida na Jornada "A Utilização Racional dos Fertilizantes em Portugal" ESAC 20 de Novembro.
SANTOS, J.Q. 2012. Fertilização – Fundamentos da Utilização dos Adubos e Correctivos. 4^a Ed. Publicações Europa-América.
FERREIRA, J. e outros 2009. As Bases da Agricultura Biológica. Tomo I - Produção Vegetal. Edibio. ISBN 978-972-99697-1-3 VARENNES A. 2003. Produtividade dos Solos e Ambiente. Escolar editora.
VIVANCOS, A. D. 1989. Tratado de Fertilización. Ed. Mundi-Prensa

Anatomia e Fisiologia Animal / Animal Anatomy and Physiology (1^o semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

To introduce the concept of the functional animal as a whole, leading the student to understand the mechanisms of the functioning of the animal. Organic farming in its aspect of animal production, is an area which can achieve the best results through the domination and use of the knowledge of animal physiology.

Syllabus:

1: General structure of the Animal- Main regions of the exterior of animals. Descriptive terms used in Anatomy. Classification of bones & functions - Osteogenesis. Osteology - The Animal skeleton - Axial and Appendicular skeleton, Arthrology. Skeleton of birds. Muscular System - Structural and functional characteristics of the muscle. Anatomical position of the muscles. Integumentary system: Skin, fur, feathers and hoofs. 2: Animal Splanchnology I – Cardiovascular System: Anatomy and physiology of the circulatory system. BLOOD/IMMUNOLOGY/ENDOCRINOLOGY: Serum, Plasma and blood, elements of the immune apparatus; Endocrine glands; Respiratory System: Anatomy and physiology of the respiratory system; Anatomy of the Digestive System: comparative anatomy; Physiology of digestion; 3: Animal Splanchnology II - Anatomy and Physiology of the Mammary Gland; Anatomy of the nervous system: divisions of the nervous system; Anatomy and Physiology of the Urinary System.

Bibliography:

BARONE R., Anatomie comparée des mammifères domestiques. Paris: Vigot, 1980
CLAYTON H.M.[et al.]. Atlas colorido de anatomia aplicada dos grandes animais. São Paulo: Editora Manole Ltda., 1997
FRANDSON R.D., WILKE, L.W., FAILS, A.D. Anatomia E fisiologia dos animais de fazenda. 6^a ed. Rio de Janeiro: Guanabara Koogan, 2005.
KARDONG K.V. Vertebrates: comparative anatomy, function, evolution. 2nd ed. Boston: McGraw Hill, 1997

MCCRACKEN T.O., KAINER R.A., SPURGEON T.L. Spurgeon atlas colorido de anatomia de grandes animais: fundamentos. Rio de Janeiro, Guanabara Koogan, 2004
SCHWARZE, E. Compendio de Anatomia Veterinária. Tomo I e II. Editorial Acribia, S.A.
SISSON, S., GROSSMAN, J.D. Anatomia de los animais domesticos, Barcelona Savat 1977.
SWENSON, M.S. Dukes Fisiologia dos Animais Domésticos, 10ª edição, Rio de Janeiro, Guanabara Koogan, 1988
TIZARD I.R. Veterinary immunology: an introduction. 6th ed. Philadelphia: W. C. Saunders Company, Cop. 2000

Sanidade Vegetal / Phytosanity (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

To provide students with the necessary elements to understand the importance of Plant Protection on Agricultural Production, namely in Organic Farming. In this framework it will be introduced the basics of Plant Protection and knowledge about epidemiology and resistance of plants to their enemies. The different groups of enemies of cultures and diagnostic methods will also be introduced. The students should acquire knowledge enabling them to develop the following skills: 1. To know the basics of Plant Protection and Plant Pathology; 2. To know the effects of the enemies on crops and their importance; 3. To know and identify the main enemies and the factors that affect their dissemination.

Syllabus:

1. Basic concepts in Plant Protection and Plant Pathology and effects caused by harmful organisms: -Enemies of crops, losses and its importance; -Plant Pathology. Plant diseases and their development. Mechanisms of plant resistance. General methods for diagnosis. 2. Identification of the main enemies of crops and factors contributing to its spread and their importance: -Mycology, Bacteriology, Virology and Phytopathological Nematology. Morphology, reproduction, classification, biological and diagnostic cycle. Examples of diseases of major economic importance of these taxa; - Agricultural Entomology and Acarology. Economic importance. Morphology, physiology, reproduction and classification. Characterization of the orders with agronomic interest. Biological cycle of species of greatest economic importance; - Herbology. Definition of weed. Losses and benefits. Classification. Species of greatest economic importance

Bibliography:

A.C.T.A. Guide Pratique de Défense des Cultures. 3ed. Paris. 1990.
Agrios, G. N. Plant Pathology. Academic Press, Inc. London. 2005.
Amaro, P. A Protecção Integrada. ISA Press. 2003.
Bovey, R. La Défense des Plantes Cultivées. 7ed. Payot Lausanne, Paris. 1979.
Bergamin Filho, A.; Kimati, H. e Amorim, L. Manual de Fitopatologia. Princípios e Conceitos. 3ª Edição. Agronómica Ceres. Brasil. 1995.
Fox, R. T.V. Principles of Diagnostic Techniques in Plant Pathology. CAB INTERNATIONAL. 1993.
Guimarães, J. M. Apontamentos de Entomologia Agrícola. I.P.C.B., E.S.A. Castelo Branco. 1986.
Marí, F. G.; Climent, J. M. L.; Comelles, J. C. e Pérez, F. F. Ácaros de las Plantas Cultivadas y su Control Biológico. Pisa Ediciones, Valencia. 1991.
Moreira, I.; Boulet, C.; Zaragoza, C.; Taleb, A. Ervas daninhas das vinhas e pomares. I.S.A. Lisboa. 1986.
Strange, R. N. Introduction to Plant Pathology. John Wiley & Sons Ltd, England. 2003.

Saúde Animal / Animal Health (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Knows the structures and competences of national, European and global institutions involved in animal health and sanitary policy; 2. Performs tasks of sanitary hygiene intervention in animal and health records in accordance with organic regulations; 3. Meets the specific and preventive biosecurity plan. 4. Understands the epidemiology and prophylaxis applied to different groups of diseases and its importance in public health.

Syllabus:

National and global animal health policy. Institutions involved at national, European and global animal health programs. Changing concepts of health and harvest of symptoms. Concepts of Epidemiology: transmission routes, gateways, carrier, intermediate hosts and vectors. The etiological agents of disease chemical, physical, microbiological and parasitological. Example of diagnostic techniques. Concepts of epidemiology. Prophylaxis and control of contagious and parasitic diseases. Concept of vector and importance in the emerging and reemerging diseases. Transmission to humans-animal life, food and water. Routes of administration of drugs (enforcement aspects) and nursing care

Bibliography:

Kijlstra and Eijck. Animal health in organic livestock production systems: a review. NJAS 54-1, 2006.
INRAP. Manipulations et interventions sur le bétail. Ovins et caprins. Éd. Foucher, Paris, 1987. ISBN 2-216-00725-0.
INRAP. Manipulations et interventions sur le bétail. Bovins. Éd. Foucher, Paris, 1997. ISBN 2-216-00725-0.
RODET, J.-C. Factores de Produção Animal Elementos para o êxito de pecuária biológica 2006.
ROJO-VAZQUEZ, HENANDEZ, S.R., NAVARRETE, L-C, ALUNDA, R., DIEZ BAÑOS, GUITIERREZ, G., MORRONDO, P., ALONSO DE VEGA, F-D. Enfermedades parasitarias del ganado ovino y caprino. Veterinária Esteves, GEA, 2003. ISBN: 84-7287-056-1.
THRUSFIELD, M. Epidemiologia Veterinária. Ed. Acribia, S.A. 1990.

TOMA, B. *Épidemiologie Appliquée à lutte Collective contre les maladies animales transmissibles Majeurs*. Association por l'étude de l'épidémiologie des maladies animales (AEEMA), France, 1996.
Vaarst M. et al., 2004. *Animal Health and Welfare in Organic Agriculture*. CABI.

Reprodução Animal / Animal Reproduction (1^o semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Know female and male sexual behavior. 2. Evaluate different reproductive methods and techniques. 3. Understand the importance of reproductive control. 4. Know reproductive systems in oviparous species.

Syllabus:

1: Anatomy of female and male reproductive system in different animal species; Estrous cycles: phases, events and neuroendocrine regulation; Spermatogenesis: hormonal control and factors affecting it; Collection, evaluation and preservation of semen; Fertilization and embryonic development. Maternal recognition of pregnancy; Implantation and placental attachment; Gestation and methods of pregnancy diagnosis; Parturition: physiological mechanism and phases; Puerperium: major events; Estrus detection methods; Estrus induction and synchronization methods; Breeding methods: natural breeding and artificial insemination. 2: Reproductive control: reproductive rates and causes of reproductive failure in different animal species; Fight against infertility; Reproduction in poultry: male and female; Reproduction in fish

Bibliography:

Senger, P. L. *Pathways to Pregnancy and Parturition*, 3th edition. USA. Current Conceptions, Inc. 2013.
Hafez, B. e Hafez, E.S.E. *Reproduction in Farm Animals*, 7th edition. USA. Lippincott Williams and Wilkins, 2000.
King G. J. *Reproduction in Domesticated Animals*. New York: Elsevier Science Publishers B. V., 1993.
Ministère de L'Agriculture, de la Peche et de L'Alimentation *Insémination Artificielle Équine*, Guide Pratique. Paris: Institut du Cheval, 1996.
Bearden, H. J., Fuguay, J. W., Willard, S. T. *Applied Animal Reproduction*, 6th ed., USA. Prentice Hall, 2003.
Buxadé C.C. *Reproduction de las Aves*. Madrid: Ediciones Mundi-Prensa, 1992.
Parkhurst Carmen R. e Mountney George J. *Poultry Meat and Egg Production*: New York: Van Nostrand Reinhold Company, 1988.
Soltner Dominique *La Reproducion des Animaux d'Elevage*. Sainte-Gemmes-Sour-Loire, Angers, France : Collection Sciences et Techniques Agricoles, 1989.

Estágio Profissionalizante I /Professional Training I (1^o semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Perform simple tasks preferably related with the animal and vegetable organic way of production, available at the ESAC farm, laboratories and experimental fields.

Syllabus:

1- Arable crops, horticulture, viticulture. 2- Forage, grass and other feed production. 3 - Poultry, cattle, goat, sheep, equine and rabbits production 4- Other farm support activities

Bibliography:

Ferreira, J. - *As Bases da Agricultura Biológica*. Edições EdiBio. 2012
Hansen, A. - *The Organic Farming Manual: A Comprehensive Guide to Starting and Running a Certified Organic Farm*. Storey Publishing. North Adams, USA. 2010. ISBN: 978 1 60 342 4806
Paajanen, T. - *Complete Guide to Organic Livestock Farming*. Atlantic Publishing. Ocala Florida, USA. 2011. ISBN 978 1 60138 381 5.

Nutrição e Alimentação Animal / Animal Nutrition and Feeding (2^o semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Understand the structural and functional interrelationships of plants and animal's constituents; 2. Identify animal species according to its existent anatomic and physiologic particularities, either on a digestive or metabolic level, recognizing its different nutrient requirements; 3. Know methods and systems of foods evaluation; 4. Use adequate methods to formulate diets for different animal species and different production level. 5. Know the rules of animal feed produced according to organic methods.

Syllabus:

1: Food composition and systems of food analysis. Classification, structure, function and metabolism of carbohydrates, lipids, nitrogenous compounds, vitamins and mineral in animal nutrition. Anatomy, physiology and microbiology of the digestive system of different animal species and main digestion products. Digestibility of food. Energy value of food and energy partition within the animal. Importance of amino acids balance in protein synthesis. Nutrient requirements of animals. 2: Nutritional characterization of foods. Evaluation of foods: energy and protein systems for ruminants and monogastric. Factors which affect the nutritional value of foods. Control mechanisms and factors that affects food and

water intake. Formulation of diets. Feedstuffs legislation for organic animal production. Raw materials, additives and other substances permitted and not permitted in feed for organic production.

Bibliography:

DROGOUL, C.; GADOUD, R.; JOSEPH, M.M.; JUSSIAU, R.; LISBERNEY, M.J.; MANGEOL, B.; MONTEMÉAS, L.; TARRIT, A. – Nutrition et alimentation des animaux d'élevage, volume I e II. Dijon: Educagri éditions, 2004.
INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE (INRA) – Alimentation des Bovins, Ovins et Caprins. Paris: INRA éditions 1988.
INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE (INRA) – Alimentation des bovins, ovins et caprins: besoins des animaux - valeur des aliments. Versailles: Éditions Quae, 2007.
MARTIN-ROSSET, W. – La alimentación de los caballos. INRA, Barcelona: Aedos Editorial, 1993.
MCDONALD, P.; EDWARDS, R.A.; GREENHALGH, J.F.D. E MORGAN, C.A. – Animal Nutrition, 6ª Ed. Edimburgh: Prentice Hall, 2002.
Regulamentação nacional e comunitária em vigor relativa à alimentação animal em modo de produção biológico: Regulamento base (CEE) nº 2092/91 do Conselho de 24 de Junho de 1991 e posteriores alterações.
http://www.idrha.min-agricultura.pt/agricultura_biologica/dossier/dossier.htm.

Rega e Drenagem / Irrigation and Drainage (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1.To know the objectives of irrigation and drainage and the role of water in crop production and its relationship to the environment; 2.To know the basics of irrigation and drainage, referenced to water resources, soil, climate, water requirements of crops and hydraulic installations; 3.To know the irrigation methods, selection criteria and calculation procedures of facilities at the field level; 4.To know the systems and drainage techniques and the respective criteria of design and maintenance.

Syllabus:

1. Introduction to irrigation and drainage: concepts and objectives; classification of methods of irrigation and drainage types; irrigation projects and irrigation schemes; issues and legislation. 2. Basis of irrigation and drainage: water resources; soil water and usable capacity, infiltration; topography and use of topographic maps; crop evapotranspiration, the soil water balance method, need for watering; hydraulic elements, Bernoulli's theorem, flows under pressure and permanent channel and hydraulic pumps. 3. Methods of irrigation: performance indicators; Surface irrigation - features and modernization; Sprinkler irrigation - installation types and characteristics, calculation of fixed installations; Micro irrigation - installation types and characteristics, and fertigation, calculation facilities. 4. Drainage: benefits of drainage, irrigation-drainage relationship, soil characteristics; surface drainage; underground drainage

Bibliography:

ALLEN, R., L.S. PEREIRA, G. RAES, M.SMITH – Evapotranspiración del cultivo. Guías para la determinación de los requerimientos de agua de los cultivos. Estudio FAO Riego y Drenaje 56. Roma, 2006.
MILLAR, A. A. - Drenagem de Terras Agrícolas: Bases Agronómicas. S. Paulo: McGraw-Hill, 1978. OLIVEIRA, I. - Técnicas de Regadio. Teoria e Prática. 2ª Ed. Lisboa: Ed. Autor, 2011.
PEREIRA, L. S. - Necessidades de água e métodos de rega. Lisboa: Pub. Europa-América, 2004.
RAPOSO, J. R. - A Rega - dos primitivos regadios às modernas técnicas de rega. Lisboa: FCG, 1996. SERRALHEIRO, R. Rega Superficial. Évora, 1996.

Pastagens e Conservação / Pastures and Conservation (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. List the specific definitions for pastures and forages to their relevance for feeding herbivorous animals and crop rotations in organic farming; 2. Know the general characteristics of the main grassland and forage species and elementary procedures for installation. 3. Relate the physiology of grassland species of husbandry adopted in the pastures; 4. Adapt the principle involved in processing of fodder for the preparation of specific work programs..

Syllabus:

I - PASTURES AND FORRAGES IN ORGANIC PRODUCTION: 1 - Designations relating to different types of pastures and forages 2 - Production and quality of grassland and forage crops. 3 - Benefits of pastures and fodder in organic production and crop rotations 4 - Physiological adaptation of species to the Mediterranean climate. 5 - Characteristics of major grassland species and forage. II - PRODUCTION AND USE OF PASTURES: 1 - Cultural Operations for the establishment of pastures 2 - Grazing systems. 3 - Actions in the management of pastures. III - CONSERVATION OF FORRAGES: 1 - Processes: hay, silage, hay, silage and dehydration 2 - Mechanisms of drying: water loss after cutting. 3 - Performance of microorganisms and ensiling characteristics of forage 4 - driving processes of conservation. 5 operative Chains for conservation programs. 6- Loss of preservation and quality of final product.

Bibliography:

CORREIA, D. - Bioquímica nos solos, nas pastagens e forragens. Lisboa, 1986
CAÑEQUE, M.; SANCHA, S. - Ensilado de forrajes y su empleo en la alimentación de rumiantes. Ed. Mundi-Prensa, Madrid, 1998

CRESPO, D. - Sistemas Forrageiros Extensivos, Ciclo de Seminários, INIA- EAN-DEEESA, 2003
 CUNHA, M. J.; CASAU, F.; AMARO, R.; OLIVEIRA, A. - Tecnologias Limpas em Agro-Pecuária. SPI, Porto, 2005
 MOREIRA, N. - Agronomia das pastagens e forragens. Vila Real, 2002
 MUSLERA, P.; RATERA, G. - Praderas y forrajes: producción y aprovechamiento. 2ª ed. Madrid, 1991
 SERRANO, E. - Pastagens do Alentejo. Univ. de Évora - ICAM, 2006
 SOLTNER, D. - Les grandes productions végétales: Phytotechnie spéciale. 15e édition. Angers, 1987
 TRINDADE, H. - Identificação de espécies pratenses e forrageiras. Vila Real, 1992
 VIGNAU-LOUSTAU, L.; HUYGHE, C. - Stratégies fourragères - pâturage - ensilage - foin. Ed. France Agricole, 2008.

Pequenos Ruminantes / Small Ruminants (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Know all the routine procedures of conducting a farm of sheep and / or goats, productive skills and their differences, the importance of the sector in the regional economy and the constraints on its development.

Syllabus:

a) domestic breeds of sheep and goats and their skills;. b) physiological mechanisms involved in food, nutrition, reproduction, lactation and growth and pathology of the species; c) standards of general husbandry, feeding, breeding and health, to each species; d) characteristics of the production of milk, meat and wool in each species and their economic importance; e) biometric systems and related structures involved; f) production systems and regional differences, constraints and objectives to be pursued.

Bibliography principal:

Boden, E. - Sheep and goat practice 2nd Ed. E. Boden. London: Baillière Tindall, Cop. 1991.
 Borrego, J. - A reprodução nos ovinos: Publicações Ciência e Vida. 1982.
 Coop, I. - Sheep and goat production / Edited by I. E. Coop. Amsterdam: Elsevier (World Animal Science, C1). 1982.
 Corcy, J. C. - La chèvre. Paris: La Maison Rustique. 1991.
 Degois, É. - Manual do criador de ovinos: guia para os pastores e criadores de ovinos Gráfica European. Coleção Euroagro, 1985.
 Dudouet, C. - La production du mouton. Paris: CEP. (Produire mieux). 1997.
 Goodwin, D. - Sheep management and production: A practical guide for farmers and students. 2nd ed. London: Itovic (Institut de l'élevage Ovin et Caprin), L'élevage Ovin Paris, Hachette. 1978.
 Luquet, F. - O leite, do úbere à fábrica de lacticínios. Col. Euroagro. Ed. Eur.-América. 1990.
 Pamer, R. - Dairy modernization. Pub by T.D. Lerner. 2005.
 Sá, F.V. - A cabra: da produção de leite à protecção da natureza 2ª ed.. Lisboa: Clássica. 1990.

Frutivicultura Biológica I / Organic Fruitviculture I (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Recognizes the importance of fruit production and viticulture in organic production at national and global level; 2 - Identifies different fruit varieties and grape vines; 3. Relates the structures of plants and their functions with growth and development; 4 - Knows the different cultural practices performed in the Spring - Summer in vineyards and orchards in organically, affecting the yield and quality of harvest.

Syllabus:

1.1- Interest of fruit in the diet and the importance of the wine culture of the peoples; 1.2- Economic importance of Fruit production and Viticulture in organic production in the national economy and the global economy; 1.3- Potential bottlenecks and difficulties of this sector; 2.1- Main fruit and grape vines varieties with biological fitness; 2.2- Different organs of woody plants; 2.3- Vegetative and reproductive cycles; 2.4- Phenology of fruit trees and vine; 2.5.- Problem of flowering and fruit set. 3.1- Implications of interventions on fruit and green vine on organically; 3.2- Cultural and physiological implications of interventions in green on the yield and quality; 3.3- Different growth stages of the fruit and berry; 3.4- Methods of determining the time of harvest; 3.5- Problematic harvest.

Bibliography:

Agusti, M. – Fruticultura. Madrid: Ed Mundi-Prensa. 2004
 Baldini, E. – Arboricultura General. Madrid: Ed Mundi-Prensa. 1992
 Castro, R.; Cruz, A.; Botelho, M. - Tecnologia Vitícola. MAP/DGABL/CVBairrada, Coimbra, 160pp. 2006
 Champagnol, F. – Elements de Physiologie de la vigne e d Viticulture. 1984
 Coletto, J. – Crecimiento y desarrollo de las especies frutales. Madrid: Ed Mundi-Prensa. 2007.
 Coombe, B.; Dry, P. - Viticulture. Vol. 2 – Practices. Winetitles, Adelaide, Austrália. 2001
 Coombe, B.; Dry, P. - Viticulture. Vol. 1 – Resources. Winetitles. Adelaide, Austrália. 2004
 Ferreira, J.C. (Coord.) – Manual de agricultura biológica. Lisboa: AGROBIO, 2002.
 Huglin, P.; Schneider, C. – Biologie et Écologie de la Vigne. Lavoisier, Paris. 2008.
 May, P. - Flowering and fruitset in grapevines. Lythrum Press, Adelaide. South Australia. 2008.
 Serrano, J. – Agricultura ecológica. Manual e guia didáctica. León: IRMA, 2003.
 Velarde, F. - Tratado de Arboricultura Frutal. Madrid: Mundi-Prensa, 1980, Vol. I

Proteção das Culturas / Crop Protection (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. To know the risk estimation methodologies to assess the intensity of enemies and the presence of beneficial organisms and their importance; 2. To know the control indirect measures available to prevent or reduce the enemies in crops; 3. To Know the control direct measures available to avoid or reduce the enemies in crops; 4. To analyze real situations with the objective to take decisions to solve pest problems in Organic Farming..

Syllabus:

1. Methodologies for risk estimation and its importance: -Principles and components of pest management. 2. indirect measures of control: -Legislation. Rules of movement of plant material; -Genetics. Resistance of plants; -Cultural. Mechanical and natural limitation. Promoting the development of the beneficial organisms. 3. Measures of direct control: -Physical, mechanical and thermal; -Biological Control. Classical biological control and biological treatment; -Biotechnical. Growth regulators, semiochemicals, allelochemicals and autocidal control; -Chemistry / Phytopharmacology. Composition of pesticides and formulations. Modes of action, resistance, toxicity to humans, domestic animals and wildlife. Behavior in the environment. Residues, tolerances and Intervals of Security. Legislation and approval. The Sustainable Use of Pesticides.

Bibliography:

Amaro, P. A Protecção Integrada. ISA Press. 2003.
ACTA. Les auxiliaires. Ennemies natureles des ravageurs des cultures. Paris. 1991.
Coutinho, C. Artrópodes Auxiliares na Agricultura. Coleção Uma Agricultura do Norte. MADRP, DRAPN. 2007.
Cunha, M. J.; Casau, F.; Amaro, R. e Oliveira, A. Tecnologias Limpas em Agro-Pecuária. Coleção Agricultura e Ambiente. SPI. 2005.
Ferreira, J. C. (Coord). As bases da Agricultura Biológica. Tomo I - Produção Vegetal. EDIBIO. 2012.
Frescata, C. Protecção contra pragas sem luta química. Coleção AGRO. Publicações Europa-América. 2004.
Helyer, N.; Brown, K. e Cattlin, N.D. Biological control in Plant Protection. Timber Press, Inc. 2003.
Simões, J. S. Utilização de Produtos Fitofarmacêuticos na Agricultura. Coleção Agricultura e Ambiente. SPI. 2005.
Torres, L. Amigos desconhecidos do Agricultor - insectos, ácaros e aranhas. Coleção o Campo no seu bolso, nº 1. EDIBIO. 2010. Manuais Técnicos da DGADR/DGAV.

Estágio Profissionalizante II /Professional Training II (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Perform simple tasks preferably related with the animal and vegetable organic way of production, available at the ESAC farm, laboratories and experimental fields.

Syllabus:

1- Arable crops, horticulture, viticulture. 2- Forage, grass and other feed production. 3 - Poultry, cattle, goat, sheep, equine and rabbits production 4- Other farm support activities

Bibliography:

Ferreira, J. - As Bases da Agricultura Biológica. Edições EdiBio. 2012
Hansen, A. - The Organic Farming Manual: A Comprehensive Guide to Starting and Running a Certified Organic Farm. Storey Publishing. North Adams, USA. 2010. ISBN: 978 1 60 342 4806
Paaajanen, T. - Complete Guide to Organic Livestock Farming. Atlantic Publishing. Ocala Florida, USA. 2011. ISBN 978 1 60138 381 5.

3rd curricular year

Gestão Empresarial e Empreendedorismo / Enterprise Management and Entrepreneurship (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Mastering the business concepts and principles for their management; Distinguishing legal and economic forms of companies and links the concepts of human behavior and the types of structures; it identifies and it applies the principles of stocks management. It knows the production planning systems. Diagnose the financial situation of a company and proposes measures to overcome possible weaknesses identified. Know the marketing techniques to advertise and promote their products and their activity. Possess technical and analytical skills for identifying and developing new business with visibility and growth potential. To master the theoretical tools and analytical methodology that allows investigating the problems of entrepreneurship in its multiple facets. Understand the fundamentals of the Business Plan and the moral values of the business

Syllabus:

Companies. Organizational Structures. Organizational Behaviour. Management of Material Resources: basic variables of management and stock control - the ABC system and economic order quantity "Wilson lot-sized formula". Method undiscounted and discounted in quantity. Management production: choice of production process, production planning. Method PERT / CPM and philosophy "just-in-time". Management of Financial Resources: financial function and financial analysis, document-based financial analysis, methods and techniques of analysis - the method of ratios, equilibrium analysis of financial profitability. Commercial Management: Strategic Marketing, Marketing Mix and the importance of market research. Entrepreneurship: ideas and business opportunities, funding sources, procedures for business creation, business plan and criteria for evaluating investments. Ethics and Ethics in Enterprise.

Bibliography:

- ABECASSIS, FERNANDO. Análise Económica e Financeira de Projectos. Lisboa: Fundação Calouste Gulbenkian, 3ª ed., 1991.
- BERNARDI, L. Manual de Empreendedorismo e Gestão: Fundamentos, Estratégias e Dinâmica. Editora Atlas, 2003.
- CHIAVENATO, I. Introdução à Teoria Geral da Empresa. Editora McGraw Hill, 3ª ed., 1993.
- BREALEY, Richard A.; Stewart C. Myers. Princípios de finanças empresariais. 5ª ed. Lisboa : Editora McGraw-Hill 1999.
- KOTLER, P., KARTAJAYA, H., SETIWAN, I. Marketing 3.0. Do produto e do consumidor até ao espírito humano. Actual Editora, 2011.
- LINDON, D.; LENDREVIE, J., LEVY, J., DIONISIO, P. RODRIGUES, J. Mercator XXI: teoria e prática do marketing, Gestão e Inovação, 2011.
- SOARES J., FERNANDES A., MARÇO A., MARQUES J., Avaliação de Projecto de Investimento na óptica empresarial. 2007.
- COURTOIS, A., PILET, M., MARTIN, C. Gestão da Produção. LIDEL, 5ª ed., 2007.
- NEVES, J. Análise Financeira: Técnicas Fundamentais. Edição actualizada Texto Editora, 15º ed,2004

Bovicultura Biológica / Organic Cattle (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Associate the main cattle, native and alien breeds, productive adopt in organic production systems; 2. Recognize the importance of growth and development of the animal in the quality and cost of production of beef; 3. Addressing different aspects that can contribute to the rationalization of production systems to adopt in organic beef production; 4. Know the legal constraints and underlying the production and marketing of milk cow rules; 5. Recognize the importance of proper management of breeding and rearing of animal's replacement, particularly in organic production of milk; 6. Describe the production cycle of dairy cows in organic production, identifying the different factors that affect the quantity and quality of milk produced; 7. Perceive, seamlessly, the similarities and differences between conventional farming and organic production of cattle meat and milk.

Syllabus:

I BEEF CATTLE ORGANIC PRODUCTION. Major breeds and production systems; Types of farms and agents of the production chain of beef; Production of meat and markets; Weight and differential growth; Earliness, meat quality and production costs; Assessment and recovery and phenotypic records; Cash and forage achievement of objectives; Management for the rationalization of the production system. II CATTLE MILK ORGANIC PRODUCTION. Production and marketing of cow's milk; Notions of physiology and anatomy of the mammary gland and lactation; Zoo technical applications: machine milking; Implications sanitary, technical and economic; Major breeds of dairy and dual purpose use in organic production in dairy cattle; Specific issues in the effective management; Husbandry of livestock feed producer; Relation between dietary management of cows and the major metabolic diseases.

Bibliography:

- BENSON, L.; ZIRQUEL, R. (1996). Organic Dairy Farming. KORN, Orangutan Press. USA
- MAURIÈS, M. e ALLARD, G. (1988). Produire du lait biologique Réussir la transition. Ed France Agricole. Paris
- NEWTON, J. (2004). Profitable Organic farming. 2nd Ed. Blackwell Science. Oxford. UK.
- PRADAL, M. Produire de la viande bovine aujourd' hui: maitrise technique et gestion des troupeaux. 2 eme éd. Paris, 1989
- RODRIGUES, A. Ed. lit. Bovinos em Portugal. Lisboa, 1981
- RODRIGUEZ, F.; GENÍS, J.; GUERRERO, J.; PERTINEZ, M.; GUERRERO, Y.; ALDEA, M. REDONDO, P. Bases de la Producción Animal. Sevilla, 2005
- ROMERO, C. Guia Práctica de Ganaderia Ecológica. Ed. Agrícola Española S.A.. Madrid.
- ROMERO, C.; Iturri, A. La cria bovina ecológica. Ed. Agrícola Española S.A.. Madrid
- VIGNAULOUSTAU, L.; HUYGHE, C. Stratégies fourragères pâturage ensilage foin. Ed France Agricole, 2008
- ZEA SALGUEIRO, Jaime Produccion de carne con pastos y forrajes. Madrid, 1990.

Culturas Arvenses Biológicas / Arable Organic Crops (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Assess the importance of organic arable crops in Portugal and around the world; 2. Know the major arable crops grown in organic production; 3. Assess individuals and current situations of organic arable crops; 4. Conduct field organic arable crops in a perspective of sustainable development.

Syllabus:

1. Main sites of production of organic arable crops in Portugal and abroad; Cultivated areas yields and incomes; Obstacles at national and international level; Crop Identification at different stages of their growth cycle; Growing cycle and crop cycle: application to the studied cultures; Main requirements of crops and their cultivation techniques. 2. Characterization of important situations of organic arable crops; Critical appreciation of some cultural options and their suitability to organic production; Quantitative and qualitative evaluation of the final production of organic arable crops; Sustainable strategies to obtain a given final product; Prospects for the future, in a viewpoint of sustainable development.

Bibliography:

COOKE, R.J.; VESETH, R.J. Wheat health management. St. Paul, Minnesota: APS Press. The American Phytopathological Society, 1991.
FERREIRA, J.C.; STRECHT, A.; RIBEIRO, J.R.; SOEIRO, A.; COTRIM, G. Manual de Agricultura Biológica. Fertilização e protecção das plantas para uma agricultura sustentável. Lisboa: Ed. AGROBIO, 3ª Ed., 2002.
FREELING, M.; WALBOT, V. The maize handbook. New York: SpringerVerlag, 1996.
GUERRERO, A. Cultivos Herbáceos Extensivos. Madrid: Ediciones MundiPrensa, 1992.
GUILLOU, G. le; SCHARPÉ, A. A Agricultura Biológica. Guia da regulamentação comunitária. Luxemburgo: Serviço das Publicações Oficiais das Comunidades Europeias, 2000.
MOURÃO, I.; ARAÚJO, J.P.; BRITO, M. Manual de Agricultura Biológica. Terras de Bouro: Município de Terras de Bouro, 2006.
SERRANO, J.F. Agricultura Ecológica. Manual y Guía Didáctica. Leon: Ed. IRMA, S.L., 2003.

Suicultura Biológica / Organic Pig Production (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Know the breeds of pigs adapted to organic production and the characteristics of different systems of organic pig production; Have knowledge on productive and reproductive management; Know how to produce piglets and fattening pigs for slaughter; Know the factors that cause stress in animals during transport to the slaughterhouse and the slaughter process; Understand the factors affecting animal welfare as well as hygiene and animal health and implement the animal biosecurity plan; Be familiar with some diseases transmitted by animal derived products that may affect consumer; Know which drugs and vaccines that can be used on pigs from organic production; Analyze, plan and implement appropriate systems of housing and environmental conditioning for pigs in organic farming; Analyze, plan and implement appropriate systems for feeding pigs in organic farming; Evaluate performance and develop appropriate management strategies in pig holdings in organic mode of farming.

Syllabus:

1 – Production, Health and slaughter of pigs: 1) Breeds of pigs adapted to organic production; 2) Production Systems; 3) Reproductive Management in organic production; 4) Care of newborn & growing piglets; 5) Animal Health and hygiene and biosecurity plan suited to organic production. 6) Animal transport; Legislation on animal welfare during transport 7) Regulations & Process of slaughter of pigs; Organic meat products and Certification of products. 2 – Nutrition and housing of pigs: 1) Nutrition and feeding of pigs in organic production; Raw materials and supplements used in the composition of the feeds and the formulation of diets; 2) Accommodation and environmental conditioning for pigs reared under organic system; a. regulations for the conversion to organic system and the necessary documents b. Housing needs. 3) Production management, records and performance assessment.

Bibliography:

BLAIR R., Nutrition and Feeding of Organic Pigs. Oxfordshire, UK. CABI, Cromwell press, 2007
BRENT G. The pigman's hand book, London, Farming press Ltd., 1995.
CARBO, C.B. Ganado porcino – Madrid, Ediciones Mundi Prensa, 1984.
HILL, J.R. & SAINSBURY, D.W.B. The Health of pigs (Nutrição, alojamentos e prevenção das doenças) England, Longman Scientific & Technical group Ltd., 1995.
LAMPKIN N. Agricultura ecológica. Madrid: Ediciones MundiPrensa, 1998
MPOFU, I. e S. MAKUZA. Pig Production: Science and Technology. Upfront Publishing, 2003.
MUIRHEAD M.R. & ALEXANDER T.J.L. Managing pig health and the treatment of disease. U.K. 5M Enterprises Ltd., 1997.
RIBEIRO J. A., MONTEIRO A. M., SILVA M. L. F. Etnobotânica – Plantas Bravias, Comestíveis, Condimentares e Medicinais. Mirandela, Editor João Azevedo, 2000.
SOEIRO A.[et al.]. Modo de produção biológico / Lisboa: DGDRural, 2000
THORNTON K. Outdoor pig production. U.K., Farming Press Books, 1995.

Frutivicultura Biológica II / Organic Fruitviculture II (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Projecting the installation of an orchard and a vineyard in organic production; 2. know the ways of obtaining plant material; 3. Know the different cultural techniques performed in autumn-winter in vineyards and orchards biological; 4. Explain the importance of proper use of drive systems in fruit trees and vines in production.

Syllabus:

1) 1 Factors in establishing an orchard and a vineyard in organic farming; 2 Method of preparing the soil according to its characteristics; 3 Compasses, density and layout of planting in different situations; 4 Techniques for planting; 5 Techniques for maintenance of soil according to the rules of organic farming. 2) 1 Methods of obtaining plant material; 2 Main rootstocks of different fruit and vine; 3 Different techniques of grafting; 4 Choose the best symbiont in every situation; 5 Importance of using quality propagation material. 3) 1 Concepts, principles, theories, and terminology of pruning, the tying down and training systems; 2 Effect of pruning operations on the physiology of trees and vines; 3 Limitations soil and climate in the choice of drive systems, 4 Different techniques of pruning and tying down; 5 Choice of driving, pruning and tying down systems in fruit and / or vineyard to organic farming.

Bibliography:

Alves, J.M., Espírito-Santo, M.D., Costa, J.C., Gonçalves, J.H, Lousã, M.F. 2009. Habitats Naturais e Seminaturais de Portugal Continental. Tipos de Habitats mais significativos e Agrupamentos Vegetais Característicos. ICNB. Lisboa.
Andrews, J. e Kinsman, D. 1990. Gravel pit restoration for wildlife: a practical manual. RSPB. Bedfordshire.
Bookhout, A. (ed.), 1994. Research and management techniques for wildlife and habitats. The Wildlife Society. Bethesda.
Hawke, C.J. e José, P.V. 1996. Reedbed Management for commercial and wildlife interests. RSPB. Beds.
Hunter M. (ed.) 1999. Maintaining biodiversity in Forest Ecosystems. Cambridge University Press. Cambridge. 698 pp.
Primack, R.B., 1998. Essentials of conservation biology. Sinauer. Sunderland.
Tuxill, J. e Nabhan, G.P., 1998. Plants and Protected areas. A guide to in situ management. Stanley Thornes. Cheltenham.
Warren, M.S. e Fuller, R.J. 1993. Woodland rides and glades: their management for wildlife. JNNC. Peterborough.

Mecanização Agrícola / Agricultural Mechanization (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

To know the constitution and operation of different types of Diesel and Otto cycle engines. To know the major functions of the transmission and hydraulic linkage of the tractor. To know how to use sets of mechanical traction, or manually operated tools, technical and economically in an organized manner in the execution of tasks necessary for organic agricultural production. Know the operation and efficient use of agricultural equipment, studying them in their applications.

Syllabus:

1. Diesel and Otto cycles engines. Study of distribution systems; intake and exhaust, fuel supply, cooling and lubrication; Transmission systems; Hydraulics; Steering, brakes and tires. 2. Equipment for adaptation of land for agriculture, tillage equipment; Equipment for distribution of manure, slurry and solid fertilizers; Equipment for sowing, planting and transplanting; Spraying and dusting equipment; Harvesting equipment. Specific equipment for use in the organic agricultural production.

Bibliography:

ATARES, P. V. A., BLANCA, A. L. – Tractores e motores agrícolas. Ediciones MundiPrensa, Madrid, 429 pp. 1993.
BRIOSA, F. – Glossário ilustrado de mecanização agrícola. Galucho, Sintra, 391 pp. 1984.
CAÑHAVATE, J. O. Las maquinas agrícolas y su aplicación. Ediciones MundiPrensa, Madrid, 467 pp. 1993.
SANTOS, F. Equipamentos Rurais. Equipamentos de sementeira, plantação e fertilização. Universidade de Trás-os-Montes e Alto Douro, Vila Real, 44 pp. 1996.
SANTOS, F. Equipamentos Rurais. Equipamentos para a recolha de cereais praganosos. Universidade de Trás-os-Montes e Alto Douro, Vila Real, 18 pp. 1996.

Manejo de Equinos e Equitação / Equine handling and equitation (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1Identify the main potentialities of integrating the organic production (OP) with equine use. 2Know the horse needs of housing and feeding under OP 3Assess the horse in its behaviour, morphology and performance. 4Understand the main OP aspects of the horse reproduction and health 5Know the main concepts and practices of horse equitation.

Syllabus:

1Introduction to horse organic production and legislation. 2The organic way of housing and feeding horses. 3Horse morphology and behavior. 4The organic way of horse breeding and health caring. 5Equitation

Bibliography:

BLANCHARD, T. L.; D.V. DICKSON, e J. SCHUMACHER, Manual of Equine Reproduction. Missouri. Mosby, 1998.
GRAY P. – The Organic Horse. The Natural Management of Horses Explained. Published David & Charles. 2001.
MacLEOD C. The Truth About Feeding your Horse. Published J.A. Allen & Coltd 2007.
MCKINNON A. O.; e J.L. VOSS, – Equine Reproduction. Williams &Wilkins. Media, 1992.
SILVA A. T. Hipologia, Guia para o estudo do cavalo. Lidel. 2009
VOGEL, C. Manual Completo de Tratamento de Cavalos. Copyright by Centralivros Lda. Lisboa, 1997

NATIONAL RESEARCH CENTER Nutrient Requirements of Horses. Committee on animal nutrition, NRC, 6th Ed, USA 2007

REZENDE, R. e A. FRAZÃO. "Equitação Conceção das instalações" Cadernos Temáticos. Divisão de Infraestruturas Desportivas Instituto Português do Desporto e Juventude, I. P., 2012

Horticultura Biológica / Organic Horticulture (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1 To understand the concept of Organic vegetable crop garden and its difference from the conventional concept. 2 To acquire notions of the importance of Vegetable crops. 3 To Understand the value of the balance of vegetable crop ecosystem. 4. To encourage the presence of biodiversity. 5. To Know prevention methods in crop protection 6. To plan, install and maintain the space of the organic vegetable garden according to organic production (OP) 7. To identify families and vegetable species and understand their cultural requirements and their interrelations with the surrounding ecosystem. 8. To have relevant knowledge in organic vegetable crops technology. 9. To adapt and complete tasks and vegetable crop practices integrated within the OP

Syllabus:

1: Know the concept of organic vegetable crops garden and their importance; Having biodiversity notions in vegetable crop garden ecosystem; Understanding the value of the balance of the ecosystem in organic vegetable garden. 2: To plan and install an organic vegetable crops garden; To know vegetable crops technology of cultural operations and special care applicable in OF; 3: To have notions of plant accelerated production of in greenhouses, tunnels, ground cover, nurseries and substrates. 4: To identify families of vegetable crop species.

Bybliography:

ALMEIDA, D. (2006). Manual de Culturas Hortícolas, Vol. I. Editorial Presença. Lisboa.

ALMEIDA, D. (2006). Manual de Culturas Hortícolas, Vol. II. Editorial Presença. Lisboa.

AUBERT, C. (1979). El Huerto Biológico. Ed. Integral. Barcelona.

BEAZLEY, M. (1995). Organic Gardening. The Royal Horticultural Society's Encyclopedia of Practical Gardening. London.

BUNT, A.C. (1988). Media and Mixes for Container Grown Plants. Unwin Hyman Ltd, London, G.B., 309 p.

MACVICAR, J. (2003). O Poder das Ervas Aromáticas. Dorling Kindersley Civilização Editores. London/Porto.

GERBE, V. (1988). A Horta Biológica. Europa América. Portugal.

MAROTO, J.V. (1990). Elementos de Horticultura General. Ediciones MundiPrensa. Madrid.

NETO, J.F. (1995). Manual de Horticultura Ecológica. Ed. Nobel. São Paulo.

RENAUD, V. & DUDONET, C. (1991). Le Potager par les méthodes naturelles, un trésor de santé. Éditions Rustiques. Paris.

SHALL, Serge (2005). Le BioJardin, Edisud. Aix en Provence

Avicultura Biológica / Organic Poultry (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

The student must be able to manage, plan and design a production unit in MPB taking into account key aspects: a high health status, housing conditions and management in line with their natural behavior, minimizing the use of medication and producing safe food with quality, following the specific legislation of organic production. Must still know reduce in puts on the farm and meet the diversity and environmental constraints

Syllabus:

Notion of biological poultry products market. Know the anatomy and physiology of birds with special focus on aspects of implementation. Portuguese breeds chickens and most strains used and adapted to outdoor systems. The fundamental needs of the birds. Behavior and wellbeing; Evaluation of the welfare of the bird concerning behavioral, physiological and productive issues. Condition score of plumage and cannibalism wounds. Legal environment related taxes, slaughter of poultry, meat and egg marketing. Food, health and biosecurity. Management and housing. Technical, drugs and health records.

Bybliography:

Lampkin, N. Organic Poultry Production. Final report to MAFF. The University of Wales, 1997. ISBN 0902124 62 5.

O'Connell and Lynch, B. Organic Poultry Production in Ireland. 2004.

RODET, J.C. O frango. Alimentação biológica e cuidados naturais alternativos. AGROBIO, Associação Portuguesa de Agricultura Biológica.[s.d.]

RODET, J.C. Factores de produção Animal. Elementos para o êxito da pecuária biológica. Instituto Natural de Recursos Ecológicos, 2005.

Soil Association. Organic Poultry Production. 2009. www.soilassociation.org/foodandfarming.

Soil Association.. Managing organic laying hens. DEFRA, s.d.

Soil Association. Rearing organic poultry for meat. DEFRA, s.d.

SPIELBERGER and Schaette. Biotherapies Vétérinaires. Mouvemente de Culture Biodynamique. Paris, 1994. ISSN: 12463353.