

Bachelor in Biodiversity and Nature Conservancy | Courses syllabus

1st curricular year

Análise Matemática / Mathematical analysis (1º semestre / Fall semester)

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

As a result of the learning process, the student: 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:

Competence 1: 1.1. Derivatives; 1.2. Antiderivative; 1.3. Definite integrals; 1.4. Areas and volumes by applying definite integrals; 1.5. Improper integrals; Competence 2: 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.
Swokowsski, E. W.; - Cálculo com Geometria Analítica. McGraw-Hill, 1983.

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

Ecologia Geral / Ecology (1º semestre / Fall semester)

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

1-Domination of ecosystem concept and their compounds particularly energy flow.2 - Identification of ecological factors and establishment of their influence in life processes. 3-Obtain the knowledge about population dynamic interactions and evaluate their impact in ecosystems. 4 - Acquires the concept of community and understands their development.

Syllabus:

1 - Ecosystems organization and development: 1.1 Ecosystems generalities, 1.2 Characteristics of natural systems, 1.3 Energy flow, 1.4 Energy and material transfer, 1.5 Ecosystems evolution. 2. Ecosystems dynamic: 2.1 Life and Climate, 2.2 Life and Soil, 2.3 Biogeochemical cycles. 3. Relationships in ecosystems: 3.1 Interactions established, 3.2 Populations dynamic and consequences, 3.3 Man role in ecosystems.

Bibliography:

BEGON, M., TOWNSEND, C.R. & HARPER, J.L. - Ecology: from individuals to ecosystems. Cambridge: Blackwell Publishing Limited, 2005.
FAURIE, C., FERRA, C., MÉDORI, P., DEVAUX, J. & HEMPTINNE, J. - Ecologie. Approche scientifique et pratique. Lavoisier, 2002.
RICKLEFS, R. & MILLER, G. - Ecology. W.H.Freeman and Company, 2000.

Biometria / Biometry (1º semestre / Fall semester)

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

Acquisition of two core skills: 1 - Knowledge of the principles and techniques used to quantify the variables associated with natural resources; 2 - Knowledge of the procedures for stock and yield evaluation.

Syllabus:

Module 1 – Variables to be collected, measurements to be performed, data collection and information processing, Module 2 - Methods of sampling, sample plots installation and data collection.

Bibliography:

- Almeida, V. V., Páscoa, F. e Silva R. (1983). Área Óptima das Parcelas de Amostragem. Notas Técnico-Científicas nº 4/83, EFN, Lisboa.
- Autoridade Florestal Nacional (2009). Instruções para o Trabalho de Campo do Inventário Florestal Nacional - IFN 2005/2006. AFN, Lisboa.
- FAO (1981). Manuel d'Inventaire Forestier. Roma
- Forestry Commission (1988). Forest Mensuration Handbook. London.
- Forestry Commission (2006). Forest Mensuration: A Handbook for Practitioners, FC-HMSO, London.
- Hamilton, G. (1975). Forest Mensuration Handbook. Forestry Commission Booklet N 39, London.
- Laar, A., Akça, A. (2007). Forest Mensuration, Springer, Dordrecht.
- Oliveira, A. (1982). Teoria da Produção Florestal. CEF/INIC E/84-2, Lisboa.
- Páscoa, F., Silva, R e Tavares, M. (1981). Tabelas de Produção. Metodologia para a Instalação de Parcelas, Recolha e Tratamento dos Dados. Notas Técnico-Científicas n 3/81, EFN, Lisboa

Geografia e Levantamentos / Geography and Surveying (1º semestre / Fall semester)

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

1 – Understand the geological and climatic phenomena with expression on the environment; 2-Recognize soil and climatic characteristics and social factors that determine the main land use systems in Portugal; 3-Meet the concepts and methods of execution of surveys and learn the various techniques of data collection and production of information; 4- learn about the different forms of cartographic representation and the way to produce and analyze.

Syllabus:

Module 1-understanding of geological phenomena and climate and their relationship with the environment and land use; Module 2-using techniques and tools of withdrawals in the production of cartography.

Bibliography:

- Avery, T., Berlin, G. L. (1992). Fundamentals of Remote Sensing and Airphoto Interpretation. Macmillan Publishing Company, New York.
- Barry, R.G. e Chorley, R.J. (1992). Atmosphere Weather and Climate, Routledge, 6ª ed.
- Bossler, John D. (2001). Manual of Geospatial Science and Technology. Taylor & Francis, New York.
- Carvalho, A.M.G. (1996). Geologia, Morfogénese e sedimentogénese, Universidade Aberta, 93, Lisboa, 189pp
- Casaca, J., Matos, J., Baio, M. (2000). Topografia Geral, Lidel, Lisboa Instituto Geográfico do Exército (2002). Manual de Leitura de Cartas (5ª Edição). Instituto Geográfico do Exército, Lisboa.
- Peixoto, J.P. (1987). O Homem, o clima e o ambiente II. As variações do clima e o ambiente. Coleção o ambiente e o Homem, Secretaria de Estado do Ambiente e Recursos Naturais.
- Portugal, J. M. (1992). Introdução às Tecnologias de Levantamento da Informação Geográfica Física, Lisboa.
- Wyllie, P.J. (1979). A Terra, Nova Geologia Global. Fundação Calouste Gulbenkian, Lisboa, 384P

Introdução à Conservação da Natureza / Introduction to Nature Conservation (1º semestre / Fall semester)

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

1. Learn the ethical and aesthetical foundation of nature conservation; 2. Learn the history of nature conservation in Portugal and in the World; 3. Understand the different action lines of nature conservation; 4. Identify the main problems of nature conservation in Portugal; 5. Nature conservation as a job.

Syllabus:

1. Learn the ethical and aesthetical foundation of nature conservation: a. Philosophical and ideological aspects since ancient Greece until present times; 2. Learn the history of nature conservation in Portugal and in the World: a. Leading figures of nature conservation across time; b. The role of NGOs's; c. The role of protected areas; 3. Understand the different action lines of nature conservation: a. Managing the ecosystems; b. Managing the populations; c. Education, awareness and motivation of the society; d. Legal and institutional aspects, in Portugal and in the World; 4. Identify the main problems of nature conservation in Portugal: a. Habitat destruction and associated causes; b. The problem of invasive species; c. Wildfires; d. Poor management of hunting and fishing; e. We only love what we know; 5. Nature conservation as a job.

Bibliography:

- Alves, J., Espírito-Santo, M., Costa, J. C., Capelo, J., e Lousã, M. (2009) Habitats naturais e seminaturais de Portugal Continental, Assírio & Alvim, Lisboa.
- Ildos Angela, S., and B. G. Giorgio. 2001. The Great National Parks of the World. New Delhi: Om Book Service.
- LPN (2008) 60 anos pela natureza em Portugal. Liga para a Protecção da Natureza, Lisboa.
- Primack, R B. (2004) A Primer of Conservation Biology. Sinauer Associates, Sunderland.
- Quercus (2005) 20 anos Quercus, Quercus, Lisboa.
- Teixeira, F. (2003) Educação ambiental em Portugal. Liga para a Protecção da Natureza, Lisboa

Estatística / Statistics (2º semestre / Spring semester)

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

As a result of the learning process, the student: 1) Understands the language and notation in statistics; 2) Covers the key concepts and the necessary methods for summarization and the interpretation of data; 3) develops and implements statistical tests and interprets the results; 4) Applies statistical techniques to support decision making.

Syllabus:

1. Descriptive statistics in one dimension. 2. Probability distributions. 3. Discrete and continuous random variables. Common discrete and continuous distributions. 4. Confidence interval for a parameter of a population. 5. Hypothesis testing for a parameter of a population. 6. Nonparametric tests. Conditions of applicability. 7. Simple linear regression. Multiple linear regression.

Bibliography:

- R. Guimarães e J. Sarsfield Cabral, "Estatística", McGraw-Hill, Lisboa (2007), 2ª ed.
- B. Murteira, C.S. Silva, J.A. Silva e C.Pimenta, "Introdução à Estatística", McGraw-Hill, Lisboa (2001).
- D. Montgomery e G. Runger, "Applied Statistics and Probability for Engineers", John Wiley and Sons, Nova Iorque (2003).

Botânica e Dendrologia / Botany and Dendrology (2º semestre / Spring semester)

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

a) To identify the structure and internal organization of vegetal bodies relating them with the function of different organs; b) To know how to identify plant species (full plants or small parts), based on morphological characteristics, using different resources such as dichotomous keys, Floras, e-Floras, Field guides, herbarium material, etc.; c) To recognize/know native plant species with more interest in Portugal, including trees, shrubs and herbaceous species; d) To recognize/know exotic plant species with more interest in forest and natural environments (including both invasive and cultivated species); e) To develop curiosity for plant world.

Syllabus:

a) Plant histology and anatomy: plant tissues and its characterization; primary and secondary growth; anatomy of roots, stems and leaves, and its relationship with physiology, on main taxonomical groups; b) Morphology of root, stem (including bark), leaf, inflorescence, flower and fruit; c) Classification- taxonomy principles; characterization of major taxonomical groups; d) Characterization (taxonomy; morphology; comparisons/ contrasts to other species with which the plant may be easily confused; distribution; vicariance; interest and utilization) of plant species with more interest in forestry and natural areas in Portugal, including species of: Adoxaceae, Altingiaceae, Anacardiaceae, Aquifoliaceae, Asteraceae, Betulaceae, Cistaceae, Cupressaceae, Ericaceae, Fabaceae, Fagaceae, Ginkgoaceae, Juglandaceae, Lauraceae, Lamiaceae, Liliaceae, Magnoliaceae, Malvaceae, Moraceae, Myrtaceae, Oleaceae, Pinaceae, Pittosporaceae, Platanaceae, Poaceae, Proteaceae, Rosaceae, among others.

Bibliography:

- Bingre P, Aguiar C, Espírito-Santo D, Arsénio P & Monteiro-Henriques T [Coord.s Cient.] 2007. Guia de Campo – As árvores e os arbustos de Portugal continental. 462 pp. In vol. IX Sande Silva J [Coord. Ed.] (2007): Coleção Árvores e Florestas de Portugal. Jornal Público/ FLAD/LPN. Lisboa.
- Fernandes, R.B. 1972. Vocabulário de termos botânicos. Separata do Anuário da Sociedade Broteriana.
- Franco, J.A. & Afonso, M.L.R. 1971-2003. Nova Flora de Portugal (Continente e Açores). Escolar Editora. Lisboa.
- Harris, J. & Harris, M. 1994. Plant identification terminology: an illustrated glossary. Spring Lake Publishing. Spring Lake, Utah.
- Lidon, F.J, Gomes H. & Abrantes A.C. 2001. Anatomia e morfologia externa das plantas superiores. Lidel. Lisboa.

Língua Inglesa e Comunicação / English Language and Communication (2º semestre / Spring semester)

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

1 - Use specific terminologies in English - Characterize, classify and define proficiently; 2 - Use advanced audiovisual communication techniques in scientific and technical tasks both in Portuguese and in English - Write scientific and technical reports using quotes - Give and discuss guided presentations.

Syllabus:

1 - English vocabulary expansion of specific terminologies of the field area - Discourse features and linguistic patterns present in sample texts: descriptions, definitions, classifications, comparisons, instructions, etc. - Academic vocabulary revision; 2 - Oral and written production in the specific context of Biodiversity and Nature Conservation both in Portuguese and in English - Advanced communication techniques in different tasks.

Bibliography:

Answers.com – Online Dictionary, Encyclopedia and much more. Disponível em WWW: URL:<http://www.answers.com> .
MURPHY, Raymond – English Grammar in Use. Cambridge: Cambridge University Press, 2004.
SINCLAIR, J. M. – Collins English Dictionary. Millennium Edition. Glasgow: Harper Collins, 1998.
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. Instituto Português da Qualidade (IPQ)
SOUSA, Gonçalo de Vasconcelos e - Metodologia da investigação, redacção e apresentação de trabalhos científicos. Porto: Livraria Civilização Editora, 1998. ISBN 972 26 1559 9.

Solos / Soils (2º semestre / Spring semester)

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

1) The constituents and properties of soils and their effects on soil quality. 2) The dynamics of mineral elements in the soil-plant-atmosphere system and the importance of physical fertility, chemical and biological soil. 3) The general factors and processes responsible for the formation and differentiation of soils. 4) The soil degradative processes (fireworks, loads, wind and water erosion, intensive production). 5) Management practices and structures for the conservation and improvement of soil quality.

Syllabus:

Functions of soils in terrestrial ecosystems. The soil as a support of biodiversity. Mineral and organic soil constituents: soil mineralogy; organic matter and the carbon cycle. Soil properties and its relation to mineral and organic constitution. Soil water: content, retention and movement in saturated and unsaturated soil; Availability of water in the soil biota. Effects of the constitution and properties of soil in plant growth and development. Factors and processes of soil formation: Horizons of diagnosis; Main soil types. Factors and laws of plant growth: Biogeochemical cycle and balance of organic matter and mineral nutrients. Effects of forest fires on soil structure, water infiltration, runoff concentration and erosion losses. Classification of erosion; factors and processes; methods to combat erosion and soil conservation practices; universal soil loss equation.

Bibliography:

AGASSI, M. Soil erosion, conservation and rehabilitation. Marcel Dekker Inc 1996
BRADY, NC.; WEIL, RR. The Nature and Properties of Soils. 13ª Ed. Mac Millan Pearson Education Inc. New Jersey, 2002
CARDOSO, JC, BESSA, MT, MARADO MB Carta de Solos de Portugal. Agr Lusitana 33: 481– 602, 1973
GARDINER, DT, MILLER, RW Soils in our Environment. Ed. Pearson. N J 2004
ISSS/ISRIC/FAO. World Reference Base for Soil Resources. World Soil Resources Reports 103, FAO. Roma. 2006
MADRP – Manual Básico de Práticas Agrícolas: Conservação do Solo e da Água. INGA Ed.1999
MENGEL, K, KIRKBY, E, KOSEGARTEN, H. & APPEL T. Principles of Plant Nutrition. 5th Ed. Int Potash Inst, Berna. Kluwer Acad Pub Nether. 2001
PORTA, J, LOPEZ, AM, ROQUERO, C Edafologia para la Agricultura e el Medio Ambiente. Ed Mundi-Prensa 2Ed 1999
SANTOS, JQ. Fertilização Fundamentos da Utilização dos Adubos e Correctivos. J. Quelhas Santos 3ª Ed. Publicações Eur-América, 2002
VARENNES A. Produtividade dos Solos e Ambiente. Esc Ed. 2003.

Inventário dos Recursos Naturais / Natural Resources Inventory (2º semestre / Spring semester)

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

1-knows and applies the methods of sampling used in natural resources and floristic inventories, knows some indicators of sustainability (biodiversity) measured in natural resources inventories and in floristic inventories; 2-knows and applies

more sampling methods used in wildlife inventories; 3 Applies the knowledge gained in a practical exercise in the field, integrating the various types of inventory.

Syllabus:

Module 1-data collection methods in the context of floristic and natural resources inventories; Module 2-data collection methods in the context of wildlife inventories.

Bibliography:

- Daubenmire R.F. 1968. Plant communities: A textbook of plant synecology. Harper & Row, New York, 300 p.
- Ferris-Kaan, R. and Patterson, G.S. 1992. Monitoring vegetation changes in conservation management of forests. Forestry Commission Bulletin, 108. HMSO, London.
- Gotelli, N. and Ellison, A. 2004. A primer of ecological statistics. 2nd Edition. Sinauer, Sunderland MA, USA.
- Krebs, Ch. 1989. Ecological methodology. 2nd Edition. Harper & Row, New York.
- Mueller-Dombois D. & Ellenberg H. 1974. Aims and methods of vegetation ecology. John Wiley & Sons.USA. 547 p.
- Reed D.D. and G.D. Mroz. 1997. Resource Assessment in Forest Landscapes. New York. John Wiley & Sons. 386 p.
- Rondeux J. 1993. La mesure des arbres et de peuplements forestiers. Les Presses Agronomiques de Gembloux, Belgique. 511 p.
- Shiver B.D. and B.E. Borders. 1996. Sampling techniques for forest resource inventory. New York. John Wiley & Sons.

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):

- 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
- Metzler, D. E. - Biochemistry: The Chemical Reactions of Living Cells, Academic Press, 1977.
- Morrison, R.; Boyd, R. - Química Orgânica, Fundação Calouste Gulbenkian, 1998

2nd curricular year

Ecofisiologia / Ecophysiology (1º semestre / Fall semester)

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

Module 1: -The physiological and morphological basis for plant growth and development and their relationship to ecosystems intervention; - The effect of environmental factors on carbon balance and the response of plants to factors as: light, temperature, water and nutrients; - The plants' mechanisms to drought resistance and water use efficiency; - The plants' adaptive strategies to flooding and extreme temperatures. Module 2: - The methodologies and techniques associated with breeding and plant propagation; - The necessary conditions to the certification of base material and reproduction material.

Syllabus:

Module 1 The physiological and morphological basis of plant growth and its relation to ecosystems intervention: (1)the plant growth and development, considering height and diameter growth and root development; (2) the effect of internal and environmental factors on photoassimilates distribution and its relationship to carbon accumulation (3)the effect of ecosystems interventions on productivity, quality and ecosystems sustainability. Module 2 Plant propagation: (1) seed-producing areas management (base material); (2) methods and techniques for collection, transportation, processing, and seed preservation; (3) plant propagation methods and techniques; (4) procedures and good practices for storage and application of phytochemicals; (5) plant quality assessment and certification; (6) conditions for plants handling and transport (7) plantation quality assessment.

Bibliography:

- Dumroese, R. Kasten; Luna, Tara; Landis, Thomas D., editors. 2009. Nursery manual for native plants: A guide for tribal nurseries - Volume 1: Nursery management. Agriculture Handbook 730. Washington, D.C.: U.S. Department of Agriculture, Forest Service. 302 p.
- Hartman, H.T.; Kester, D.E.; Davies, F.T.; Geneve, R.; 2001. Plant propagation: principles and practices, 7th ed. Prentice-Hall, Inc., New Jersey. ISBN 13: 9780136792352
- Pallardy, S.G. 2008. Physiology of Woody Plants (3th Ed.). San Diego: Academic Press. ISBN: 978-0-12-088765-1
- Ribeiro, D., Baião, M., Teixeira, A., 1999. Sementes e Plantas Florestais, importância da sua qualidade. DGF, Lisboa.

Economia dos Recursos Naturais / Natural Resources Economics (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 concepts and methodologies used by the economic science; 2. To understand the mechanisms of price formation in market economy and the relationship between economic factors and technical production levels; 3 To understand the relationships between the economy and the natural resources; 4. To discuss options for the management of renewable natural resources.

Syllabus:

1. Introduction: 1.1. Fundamental problems facing the economy; 1.2. Main methodologies used in economic science; 1.3. The concepts of opportunity cost, willingness to pay and willingness to accept; 1.4. Production possibilities frontier. 2. Market and economic agents: 2.1. Economic circuits and relations between agents; 2.2. The supply and demand for food; 2.3. Market imperfections; 2.4. Inputs markets; 2.5. Profit maximization using production and costs functions. 3. Natural resources management: 3.1. Natural resources typology; 3.2. Property rights, public goods and externalities; 3.3. The issue of common property and open access; 3.4 Environmental goods evaluation; 3.5. General model of exploitation of a renewable resource; 3.6. The extinction of renewable resources and the loss of biodiversity.

Bibliography:

FRANK, R. e BERNANKE, B. – Princípios de Economia. Lisboa: Mc Graw Hill, 2003.
GREGORY, G. – Resource Economics for foresters. New York: John Wiley & Sons, 1987.
KLEMPERER, W. – Forest resource economics and finance. New York: McGraw-Hill, 1996.
PERMAN, R. [et al.]. Natural resource and environmental economics. 3rd edition. Pearson: Harlow, 2003.
RANDALL, A. Resource economics: an economic approach to natural resource and environmental policy. 2nd ed. John Wiley & Son: New York, 1987.
SAMUELSON, P. e NORDHAUS, W. – Economia. 16^a ed. Lisboa: Mc Graw Hill.

Recursos Hídricos / Water Resources (1^o semestre / Fall semester)

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

The general objectives are, in the use and conservation of natural resources and the local context of forestry and agro-forestry systems, promoting the following student competencies: 1) Identify the main problems related to water in its quantitative and qualitative components, at different spatial scales; 2) Know hydrological models and their relation to the dynamics of forest systems; 3) Know the characteristics and impacts of extreme hydrological phenomena of drought and floods; 4) Know the techniques for the conservation of water and soil from the perspective of the National Plan for Water Efficiency; 5) Know methods of integrated management of water resources and their environment according to the Water Law.

Syllabus:

1) General concepts of Hydrology and Water Resources Management. 2) Hydrological balance in river basins; interrelation with the characteristics of forest and natural area systems. 3) Evapotranspiration and water-yield relationships for forest stands. 4) Groundwater and surface water resources; maintenance and operation. 5) Techniques for conserving water and soil; Torrential correction; supply and drainage. 6) Interaction between the forest, the water system, and water quality. Influence of riparian zone on water resources. 7) Aspects of the legislation on water management.

Bibliography:

AZAGRA, A. M. e HEVIA, J.N. – Hidrologia Florestal, el ciclo hidrológico. Universidade de Valladolid, 1996.
CHOW, V.T., MAIDMENT, D.R. e MAYS, L.W. – Applied Hydrology. New York: McGraw-Hill Series in Water Resources and Environmental Engineering, 1988.
CUNHA, L.V., GONÇALVES, A. S., FIGUEIREDO, V.A. e LINO, M. – A Gestão da Água, princípios fundamentais e sua aplicação em Portugal. Lisboa: Fundação Calouste Gulbenkian, 1980.
HIPÓLITO, J.R. e VAZ, A.C. - HIDROLOGIA E RECURSOS HÍDRICOS. Lisboa: ISTPress, 2011.
LENCASTRE, A. e FRANCO, J. - Lições de Hidrologia. Lisboa: Universidade Nova de Lisboa, 1984.
MOLDEN, D. (Ed.) – Water for Food, Water for Life, a comprehensive assessment of water management in agriculture. London, Sterling: Earthscan, 2007.
MUSY, A. e HIGY, C. – Hydrologie, une science de la nature. Lausanne: Presses Polytechniques et Universitaires Romandes, 2004.

Silvicultura Geral / General Silviculture (1º semestre / Fall semester)

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

1. Possesses knowledge that allow to characterize the natural, semi-natural and artificial forest, for its composition, structure and dynamics of evolution, recognizing its multi-functionality; 2. Relates the aspects of eco-physiology to the productivity of plants and to the forestry practiced, as a determinant of sustainable management of forest systems; 3. Possesses knowledge and problem-solving capacity in forest ecosystems, in order to ensure its preservation, maintenance, protection or use, integrating concepts of DFC; 4. Know the dynamics and the forms of intervention in forest systems to meet management objectives.

Syllabus:

Module 1-forestry: forestry interventions and characterization in forest stands; Module 2-forestry systems applied to stands and other types of forestry.

Bibliography:

Assmann E. The principles of forest yield study. Pergamon Press. 506 p. 1970.
Direcção-Geral das Florestas. Inventário Florestal Nacional, Portugal Continental, 3ª Revisão. Ministério da Agricultura. Editideias, Lisboa, 233 p. 2001.
Evans, J. Silviculture of broadleaved woodland. Forestry Commission. Bulletin 62, HMSO Pub. 232 p. 1984.
Hibberd B.G. Forestry practice. Forestry Commission. Handbook 6. HMSO Pub. 1991.
Lanier L., Badre M, Delabrazé J. et Flammarion P. Précis de Sylviculture. 2e édition. Engref-Nancy, France. 477 p.1994.
Matthews JD. Silvicultural systems. Oxford University Press. 284 p. 1991.
Monteiro A.A. Técnicas de produção florestal. INIC, Lisboa. 331 p. 1982.
Oliveira C.A. Teoria da produção florestal. Centro de estudos Florestais. 519 p. 1984.
Savill PS, Evans J., Auclair D. & Falck J. Plantation silviculture in Europe. Oxford University Press. 297 p. 1997.
Schütz J.P. Sylviculture 1. Presses Polytechniques et Universitaires Romandes. Suisse. 243 p. 1990.

SIG e Deteção Remota / GIS and Remote Sensing (1º semestre / Fall semester)

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

1 - Master the concepts and principles of Geographic Information Systems (GIS) and recognizes its role as a tool to support decision making in land management; 2 - Master the Remote Sensing (RS) methods of information analysis and processing; 3 - Uses the available tools and techniques (GIS and RS) in practical work and in a project components development

Syllabus:

Module 1 - Data collection, information analysis and cartographic production; Module 2 - Using GIS tools and digital image processing of remote sensing images to support the decision-making process.

Bibliography:

Bossler, John D. (2001). Manual of Geospatial Science and Technology. Taylor & Francis, New York.
Burrough, P., McDonnell, R. (1998) Principles of Geographical Information Systems - Spatial Information Systems and Geostatistics. Oxford University Press, Oxford.
Cosme, António (2012) Projecto em Sistemas de Informação Geográfica. Lidel, Lisboa.
DeMers, Michael N. (2005) Fundamentals of Geographic Information Systems (3rd Edition). John Wiley & Sons, Inc., New York.
Longley, P., Maguire, D., Goodchild, M., Rhind, D. (1999). Geographical Information Systems, Vol I - Principles and Technical Issues & Vol II – Management Issues and Applications, John Wiley & Sons, Inc., New York.
Matos, João. (2008). Fundamentos de Informação Geográfica - 6ª Edição, Lidel, Lisboa.
Tso, B., Mather, P. (2001) Classification Methods for Remotely Sensed Data, Taylor & Francis, New York.

Biologia da Conservação / Conservation Biology (2º semestre / Spring semester)

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

a. To know the main theories, concepts and types of biological conservation; b. To understand the principles of biological diversity conservation; c. To know how to recognize and evaluate the main threats to biological diversity; d. To know how to monitor populations and quantify biological diversity; e. To know legal frameworks applied to species and habitats conservation; f. To be able to collaborate on the development of proposals and implementation of conservation/ management plans of species and habitats; g. To be able to collaborate on the selection, evaluation and management of areas with interest for conservation and/ or protection status.

Syllabus:

1. Introduction to nature conservation: a) values and philosophy; b) interdisciplinary; c) ethics and conservation; d) main concepts; 2. Biodiversity: a) how to measure; c) levels of diversity; 3. Threats to biodiversity: a) habitats destruction; b) over-exploitation of resources; c) biological invasions; d) climatic changes; e) pests and diseases; etc.; 4. Conservation of species and populations: a) monitoring; b) loss of genetic variability; c) populations dynamics; d) analyses of viability;

e) vulnerability to extinction; 5. Conservation of habitats and ecosystems: a) species interactions; b) succession; c) landscape diversity; d) keystone species, flagship species and indicator species; e) fragmentation, insularity; 6. Legal protection status of species and habitats: Habitats Directive and Red Books; 7. Conservation in-situ and ex-situ; 8. Action plans to conservation and / or management of species and habitats.

Bibliography:

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Jeffries, M. 1997. Biodiversity and Conservation. Routledge, New York.
Marchante, H., Morais, M., Freitas, H. & Marchante, E. 2014. Guia Prático para a Identificação de Plantas Invasoras em Portugal. Imprensa da Universidade de Coimbra. Coimbra. Pp. 208. ISBN: 978-989-26-0785-6
Primack, R.B. 2010. Essential of Conservation Biology. 5ª Ed. Sinawer.
Sociedade Portuguesa de Botânica. 2012-2013. Flora-On: Flora de Portugal interactiva. disponível em <http://www.flora-on.pt>.

Ecologia aquática e terrestre / Aquatic and terrestrial ecology (2º semestre / Spring semester)

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

Knowledge: To know 1) the biodiversity; 2) the ecological functioning, and 3) the disturbance conditions of terrestrial and freshwater ecosystems. Skills: 1) inventory of terrestrial and freshwater ecosystems biodiversity; 2) diagnose the causes for the current ecological state of terrestrial and freshwater ecosystems; 3) implement mitigation and/or recovery measures in terrestrial and freshwater ecosystems to promote their preservation and sustainable management. Competences: Demonstrate ability to 1) work in team; 2) manage and organize work; 3) adapt to new methodologies and technologies.

Syllabus:

Module 1 – Terrestrial ecosystems. 1.1. Phytosociology of terrestrial habitats; sustainable use of natural and semi natural terrestrial ecosystems; 1.2. Temporal and spatial dynamics: ecological succession, biotic and abiotic evolution: notions of vegetation series, phytogeography and biogeography; 1.3. Causes and effects of disturbance on terrestrial vegetation and solutions for ecological recovery. Module 2 – Freshwater ecosystems. 2.1. The importance of freshwater and freshwater ecosystems; 2.2. Types and characteristics of freshwater ecosystems; 2.3. Biology, ecology and functioning of streams; 2.3. Causes and effects of disturbance on freshwater ecosystems and solutions for ecological recovery.

Bibliography:

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Alves, J, Espírito Santo, MD, Costa, JC, Capelo Gonçalves, JH & Lousã, MF 1998. Habitats Naturais e Semi-Naturais de Portugal Continental. Lisboa: Inst Conserv Natureza
Blanco Castro, E, Costa Tenorio, M & Escribano Bombín, R. 1997 Los Bosques Ibéricos. Barcelona: EdPlaneta
Capelo, J. 2003. Conceitos e Métodos da Fitossociologia. Lisboa: Est Florestal Nacional
Allan, JD & Castillo, MM. 2007 Stream Ecology: Structure and function of running waters. Dordrecht Spring
Elosegi, A & Sabater, S (eds.). 2009. Conceptos y técnicas en Ecología Fluvial. Bilbao: Fund BBVA.
http://www.fbva.es/TLFU/microsites/ecologia_fluvial/index.htm
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Rey, M, Espigares, T & Nicolau, JM (eds.). 2003. Restauración de Ecosistemas Mediterráneos. Alcalá Henares, Serv Pub Univ Alcalá.

Ordenamento Biofísico / Biophysical Planning (2º semestre / Spring semester)

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

The main objective of this curricular is to provide an introduction to the theoretical principles, methods and tools for land evaluation for conservation as well as other bio-physical planning studies. In the end of the course the students should be able to: (1) Assess the value and limitations of biophysical resources for conservation uses; (2) Know the regulations concerning to land use planning and management in conservation areas. (3) Elaborate suitability assessments and spatial plans ensuring the ecological equilibrium of ecosystems.

Syllabus:

Principles of land evaluation for conservation purposes; - Environmental analysis: Biophysical variables and its spatial modelling; Land use and land use classifications; Morphology of natural areas and principles of ecological planning; Ecosystems functions and services; Methods for suitability assessment in natural areas; Spatial planning regulation

Bibliography:

Beinat E, Nijkamp P. 1998. Multicriteria Analysis for Land-Use Management. Netherlands: Kluwer Academic Press. p 1-13.
Fadigas L. 2011. Fundamentos ambientais do ordenamento do território e da paisagem. Edições Sílabo, 2ª Edição revista e aumentada. 200 p.
Malczewski J. 1999. GIS and Multicriteria Decision Analysis. New York: John Wiley & Sons, Inc. 392 p.

Sistemas Agroflorestais / Agroforestry (2º semestre / Spring semester)

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

1. Understand the concept of agroforestry and its tipification, using relevant real-world examples; 2. Learn the concepts and the techniques associated to range management in an agroforestry environment; 3. Master the concepts and the techniques associated with the montado system.

Syllabus:

1. The concept of agroforestry, its classification, the advantages and disadvantages of the different systems. Examples from Portugal and from other world regions. 2. Learn the concepts and the techniques associated to range management in an agroforestry environment. Resolution of practical questions and field visits to illustrate the concepts and techniques related with the livestock component and range management. 3. Concepts and techniques associated with the montado system. 4. Aspects of cork oak management related with the regeneration, the silviculture and the harvesting of cork in the montado system. Relationships with the other components of the system.

Bibliography:

- MACDICKEN, K., VERGARA, N., 1990. Agroforestry: classification and management. John Wiley & Sons, Inc., New York.
- NAIR, R., 1993. An Introduction to Agroforestry. Kluwer Academic Publishers, Dordrecht.
- RIGUEIRO-RODRÍGUEZ, A., MCADAM, J., and MOSQUERA-LOSADA, M. R. 2008 Agroforestry in Europe. Series: Advances in Agroforestry, 6, 452.
- SILVA JS (ed), 2007. Os Montados - Muito para além das árvores. Público/Fundação Luso-Americana para o Desenvolvimento/Liga para a Protecção da Natureza, Lisboa
- UMRANI, R., and JAIN, C. 2010 Agroforestry: Systems and Practices: Oxford Book Company.

Técnicas de Intervenção nos Ecosistemas / Intervention Techniques on Ecosystems (2º semestre / Spring semester)

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

This course aims to enable students with criteria for making and implementing decisions, in terms of technical intervention on ecosystems, inherent to different stages of development and according to the defined objectives (conservation, protection or production): Module 1 - for plant establishment or regeneration or protection of ecosystems; for tending operations (cleaning, fertilizing, scrolling on hardwoods, coppice and phytosanitary treatments); Module 2 - for technical intervention on ecosystems after establishment and for tending operations (brushing, pruning, thinning, fruit harvesting / pine cone), harvesting and timber transport.

Syllabus:

The study of the different techniques of intervention on ecosystems, inherent on establishment, regeneration, tending and harvesting is based on: (1) the physical environment analysis and on identifying their constraints; (2) identification of the operations to perform, according to the objectives and physical environment characteristics; (3) identification of the effect of the site factors on work yield and unit labor costs; (4) the analysis and estimation of processing time of operations and associated costs; (5) establishment of operations schedule and financial; and (6) the adoption of the best practices for storage and application of phytochemicals products.

Bibliography principal:

- CAOF, Comissão de acompanhamento das operações florestais, Matriz de referência das operações, <http://www.idrha.pt/caof>
- CEMAGREF. 1982. Techniques de reboisement – Réflexions Générales- Conception. Division Techniques de reboisement, CEMAGREF, Note Technique n° 47, 72 pp.
- DGF. 2002. Manual de boas práticas florestais. Lisboa, DGF
- FCBA, 2010. Manuel d'exploitation forestière. Tome I. França, FCBA (ed.). 442pp. ISBN 13 : 9782856840139
- FERNANDEZ M. ; MILLAN R. ; ANGULO AM ; LOMBAO, A. 1997. Preparación del terreno para la repoblación forestal. SILVANUS. 63 pp.
- FORESTRY COMMISSION. 1991. Forestry Practice, Handbook 6. BG Hibberd (ed). London: Forestry Commission, 239 pp
- LOURO G ; MARQUES H. ; SALINAS F. 2000. Elementos de apoio à elaboração de projectos florestais .Estudos e Informação, n° 320. DGF. 123 pp.
- Reboredo, F. (ed) 2014. Forest Context and Policies in Portugal: Present and Future Challenges. World Forests 19. ISBN-13: 978-3319084541.

3rd curricular year

Engenharia Natural / Natural Engineering (1º semestre / Fall semester)

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

1. Know concepts, techniques and applications of Natural engineering. 2. Devise, implement and monitor alternative projects depending on the characteristics of degraded areas and the intended objectives. 3. Produce, implement and monitor projects of Bioengineering applied to natural areas for Biodiversity improvement and enhancement of Nature Conservancy.

Syllabus:

Module 1. Introduction to Bioengineering. Definition of sustainability criteria Bioengineering, application fields, advantages, limitations and operational constraints, Materials, the vegetation as a living building material, features and biotech behavior, criteria for selection of autochthonous species and methods of collection and application period. Module 2. Techniques of Bioengineering, use typologies and application domains, cover/coating techniques, stabilization techniques, combined techniques and complementary techniques. Projects: biophysical elements of design, the preliminary project to final execution project, specifications, monitoring and tracking. Case studies in the field of Biodiversity and Nature Conservation. The engineering at the service of Biodiversity.

Bibliography:

Andrews, J., D. Kinsman. 1990. Gravel pit restoration for wildlife: a practical manual. RSPB. Bedfordshire.
Clewell, A., J. Rieger, J. Munro (Society for Ecological Restoration International). 2005. Guidelines for Developing and Managing Ecological Restoration Projects, 2nd Edition.
Cortes, R.M.V. 2004. Requalificação de cursos de água. Instituto da Água, Lisboa.
Cortina, J., R.M. Vallejo. 2004. Restoration Ecology. Encyclopedia of Life Support Systems. UNESCO-EOLSS Publishers Co.
Fernandes, J.P., A. Freitas. 2011. Introdução à Engenharia Natural. EPAL.
Hobbs, R.J., K.N. Suding (eds.) 2009. New models for ecosystem dynamics and restoration. Society for ecological restoration, Island Press, Washington, DC
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Moreira, I., M.T. Ferreira. 2002. Ecosistemas Aquáticos e Ribeirinhos - Ecologia, Gestão e Conservação. INAG, Lisboa.

Gestão do Fogo / Fire Management (1º semestre / Fall semester)

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

1. Learn about the problem of forest fires in Portugal, both the aspects related to the ignitions as those related to fire propagation and fire effects; 2. Learn and apply forest fire prevention techniques, in a way to diminish the number of ignitions, to prevent the extension of wildfires, to increase forest resilience and to mitigate the effects of fire. 3. Learn the different aspects related with firefighting, including aspects dealing with pre-suppression, initial attack, extended firefighting, indirect attack and mop up

Syllabus:

Characterization of the phenomenon of fire in the ecosystems: combustion, and fuel characteristics; propagation and fire behaviour; fire behaviour modelling; fire ecology: fire effects; post-fire management; causes and origins of forest fires; evolution and present situation of forest fires in Portugal and in Europe. Fuel management and fire management. fuel management techniques, including prescribed burning; preventive silviculture; forest protection networks; maps of fire risk. Firefighting: pre-suppression, fire weather indices, initial attack, extended attack, the use of chemical products to fight fires; indirect attack; mop up; investigation of fire causes

Bibliography:

Moreira, F., Catry, F.X., Silva, J.S., Rego, F. (Eds.), 2010. Ecologia do Fogo e Gestão de Áreas Ardidas. ISAPress, Lisboa.
Silva, J. S., Rego, F., Fernandes, P., and Rigolot, E. (2010). "Towards Integrated Fire Management" Research Report. City: European Forest Institute: Joensuu, pp. 229.
Biro, Y. (ed.). 2009. Living with wildfires: what science can tell us. Päivinen, R. (ed.). European Forest Institute, Joensuu. 86 p.
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Gestão de Recursos Faunísticos / Management of Wildlife Resources (1º semestre / Fall semester)

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

1. Knows the bio-ecology of the different groups of vertebrates with importance in Portugal and the role they play in the ecosystem where they are included; 2. Knows the basics of the anatomy of the major vertebrate groups; 3. Knows the concepts associated to hunting and to fishing, as well as the proper techniques for sustainable exploitation of these; 4. Learn the basics of hunting management, in the management of populations, habitat and predators, and relations with the Conservation of Nature and other nature tourism activities

Syllabus:

Module 1. To know the wildlife: the evolution of vertebrates; species and most important groups of species; their geographical distribution and habitats; biology (anatomy, physiology, external morphology, ethology and animal health), and ecology of different taxa with particular regard to the species with hunting and fisheries importance; endangered species and protection measures. Module 2. Hunting: historical introduction; hunting exploitation (processes and means of hunting), relations with the Conservation of Nature. Fishing: concepts and legislation on inland fishing, fishing exploitation. Planning and management: management plans of hunting estates; population management; predator control; repopulation; monitoring techniques; habitat suitability indices (HSI); relations with other nature tourism activities such as bird watching.

Bibliography:

Almeida, N.F., Almeida, P.F., Gonçalves, H., Sequeira, F., Teixeira, J. e Almeida, F.F. 2001. Anfíbios e Répteis de Portugal. Fapas. Porto.
Bolen, E.G. e Robinson, W.L. 2002. Wildlife ecology and management. Prentice Hall. New Jersey.
Braun, C.E. (ed.) 2005. Techniques for wildlife investigations and management. The Wildlife Society. Bethesda.
Cabral, M.J. (coord.) 2006. Livro Vermelho dos Vertebrados de Portugal (peixes dulciaquícolas e migradores, anfíbios, répteis, aves e mamíferos). ICN, Assírio & Alvim.
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Mularney, K., Svensson, L., Zettertröm, D., Grant, P.J. 2003. Guia de Aves. SPEA e Assírio e Alvim.
Pereira, C.A. 1994. Espécies Aquícolas de Portugal Continental. DGF, Lisboa.
Ribeiro, F., Beldade, R., Dix, M. & Bochechas, J. 2007. Carta Piscícola Nacional. DGRF - Fluviatilis, Lda. Lisboa.
Sinclair, A., Fryxell, J., e Caughley, G. 2006. Wildlife Ecology and Management. Blackwell.

Gestão de Recursos Naturais / Natural Resources Management (1º semestre / Fall semester)

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

Virtually all problems in natural resource management involve decisions: choices that must be made among alternative actions to achieve objectives. This UC is intended for students in the fields of natural resource management who will be confronted with complex and difficult decision making problems. In the end of the course the students will be able to: (1) structure a complex decision problem; 2) Integrate information coming from different sources and disciplines in a common framework; (3) use different methods and tools to structure decisions with an explicit spatial dimension, involving several objectives and different stakeholders; (4) discuss several case studies.

Syllabus:

Part 1 Introduction to decision aid in natural resource management. The role of decision aid in natural resource management. Approaches to natural resource management. Components of structured decision aid. Identifying objectives in natural resource management. Working with stakeholders in natural resource management. Part 2 Tools for decisions aid and analysis. Methodologies for structuring problems and decisions. Multicriteria decision analysis methods. Methods for optimal decisions. Identifying and managing uncertainty in decision aid. Part 3 Case Studies.

Bibliography:

Ausden, M. 2007. Habitat Management for Conservation: A Handbook of Techniques. Oxford University Press, ISBN 978-0-19-856872-8
Bonar, A.E. 2007. The conservation professional's guide to working with people. Island Press. Washington.
Buck, E.L., Charles C., Geisler, C. C., Schelhas, J. , Wollenberg, E. (ed.) 2001 Biological diversity : balancing interests through adaptive collaborative management. CRC PRESS
Conroy, M. Peterson, T. J. 2013. Decision making in natural Resource management. John Wiley & Sons, LTD.
Graeme, L. , Worboys, W. L.F., Lockwood, F. M.2011. Connectivity Conservation management. A Global guide. Earthscan, London.
MEFFE K. G., NIELSEN, A. L., KNIGHT, L. R., SCHENBORN, A. D. 2002. Ecosystem Management: Adaptive, Community-Based Conservation. Island Press.
Lara, M., Doyen, L. 2008. Sustainable management of natural resources: mathematical models and methods. Springer-Verlag Berlin Heidelberg.

Avaliação de Impactes Ambientais / Environmental Impact Assessment (2º semestre / Spring semester)

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

Know the relevant legislation to implement Environmental Impact Assessments; Know and justify the need for the different phases and associated methodologies. Understanding the importance of public participation process, known methods of public participation, and their efficacy. Know techniques to assess impacts. Develop technical skills to design and implement monitoring networks. Develop competences to help with an audit. Be proficient in the use of methods and evaluation of decision alternatives.

Syllabus:

Module 1. Knowledge of the Environmental Impact Assessment process. 1 - Introduction to Environmental Impact Assessment. 2 - Principles of EIAs. 3 - Origins and development of EIAs. 4 - National Legislation and European frameworks. 5 - Scoping in EIAs. 6 - Elaboration and content of an Environmental Impact Assessment Studies. 7 - Technical Assessment of Environmental Impact Assessment Studies. 8 - Public participation and public hearings. 9 - The Environmental Impact Declaration. 10 - Post-Assessment (Monitoring and Audits). 11 - Methods for decision-making and evaluation of alternatives. 12 - Strategic Environmental Assessment. Module 2. Development of an Environmental Impact Study. 1.1 - Project description and legal framework. 1.2 - Identification of potential impacts. 1.3 – Scoping 1.4 - Baseline characterization. 1.5 - Forecast impacts. 1.6 – Methods for impact and alternatives assessment. 1.7 - Mitigation and compensation. 1.8 - Monitoring and gaps.

Bibliography:

- Canter, L. W. – Environmental Impact Assessment. Mc Graw-Hill, 1996.
Environmental Resources Management (ERM) – Guia de Selecção de Projectos. Direcção-Geral do Ambiente, Segurança Nuclear e Protecção Civil da Comissão Europeia, 1996.
Environmental Resources Management (ERM); Grontmij Consulting Engineers – Guia de Determinação do âmbito das informações a fornecer. Direcção-Geral do Ambiente, Segurança Nuclear e Protecção Civil da Comissão Europeia, 1995.
Henriques, A. G. – Processo de AIA: Avaliação de Impacte Ambiental. Lisboa: Laboratório Nacional de Engenharia Civil, 1991.
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Petts, J. - Handbook of Environmental Assessment - Volume 2. Blackwell Science, 1999.

Turismo de Natureza / Nature tourism (2º semestre / Spring semester)

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

Knowledge: 1) To know the typology of protected areas, their geographical distribution and the reasons for their status; 2) Understand the environment as the basis for nature tourism; 3) To know the ecosystems of protected areas; 4) To know legislation on hunting, fishing and nature tourism. Skills: 1) To interpret, collaborate on the elaboration and follow nature and biodiversity conservation projects; 2) To monitor and evaluate the sustainable use of protected areas; 3) To implement good environmental practices and conduct codes. Competences: Demonstrate ability to 1) work in team; 2) manage and organize work; 3) adapt to new methodologies and technologies.

Syllabus:

1. Nature activities and environment: status of biodiversity in Portugal and the world; touristic interests in biodiversity; 2. Protected areas, Natura 2000 network, Ramsar sites, and biosphere reserves: typology, creation, location and codes of conduct; 3. Biodiversity, importance and vulnerability of protected areas; 4. Nature tourism and codes of conduct: legislation, tourism enterprises and tourist animation activities; measures for protection, conservation and management of ecosystems; 5. Hunting and fishing: legislation, relation with other nature tourism activities, and with nature and biodiversity conservation.

Bibliography:

- ADRAT. 2006. Gestão de turismo e interpretação da natureza nas áreas classificadas do Alto Tâmega. AgroNatur. Programa Leonardo da Vinci – Projecto InNature, Associação de Desenvolvimento da Região do Alto Tâmega (disponível em http://project-agronatur.com/pages/page16/pt_atualizacoes1.pdf)
ALVES, J et al. 2009. Habitats Naturais e Seminaturais de Portugal Continental. Assírio & Alvim, ISBN: 978-972-37-1380-0.
CASTAÑER, M; FREGUELL, RM. 1998. Turismo sostenible en los espacios protegidos. El caso del parque natural de la zona volcánica de la Garrotxa”, Sociedade e Território, 28: 80-87.
DIAS, R. 2003. Turismo Sustentável e Meio Ambiente, São Paulo; Editora Atlas.
ICNF: caça, <http://www.icnf.pt/portal/caca>
ICNF: natureza e áreas classificadas, <http://www.icnf.pt/portal/naturaclas>
ICNF: pesca, <http://www.icnf.pt/portal/pesca>
ICNF: turismo de natureza, <http://www.icnf.pt/portal/turnatur>

Educação Ambiental / Environmental Education (2º semestre / Spring semester)

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

1) Knows the concept of Environmental Education (EE) and its development in Portugal and the world; 2) Understands the importance of EE in citizenship's formation and their contribution towards sustainable development; 3) Acquires the technical and pedagogical competences necessary to provide EE initiatives; 4) Plans and directs EE initiatives, both passive and active

Syllabus:

1. Education concepts. General concepts of formal and informal education. 2 The Environmental Education (EE). The concept of EE, its historical and ideological developments in Portugal and worldwide. The role of EE in changing attitudes and behavior of citizens and their contribution to sustainable development. 3 The profile and skills of environmental educators: A technical training environment, teacher training and the animation group. 4 EE actions: design, implementation and evaluation of actions of passive EE; design, implementation and evaluation of EE projects.

3.3.9. Bibliografia principal:

Alves, Fernando Louro; Caeiro, Sandra. Educação Ambiental, Universidade Aberta, Lisboa, 1998.

Giordan, André. A Educação Ambiental na Europa, Instituto de Inovação Ambiental: Instituto de Promoção Ambiental, Lisboa, 1996.

Palmer, Joy; Neal, Philip. The Handbook of Environmental Education, Rowledge, London, 1994.

Teixeira, F. . Educação Ambiental em Portugal. Lisboa: Liga para a Protecção da Natureza. 2003

Elective courses (please consult with ri@esac.pt to know the semesters)

Desenvolvimento Local / Local Development

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

To know the techniques and methods for the implementation of plans and projects of local development; To know the techniques and methods to promote local participation in the implementation of plans and projects of local development.

Syllabus:

1. Concepts, myths, philosophies and approaches to development. 2. Development indicators. 3. Differences in development. 4. Participatory survey techniques of local development. 5. Construction of participatory and gender-sensitive local development projects. 6. Evaluation techniques of local development projects

Bibliography:

Bishop, Claire (2002). Guia Técnico da Gestão do Ciclo de Projecto. Programa de Análise Sócio-económica e de Género (ASEG), Roma: Organização das Nações Unidas para a Alimentação e Agricultura.

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Schiefer, U.; Bal-Dobel, Lucinia; Baptista, António, Dobel, Reinald; Nogueira, João e Teixeira, Paulo (2006). Manual de Planeamento e Avaliação de Projectos. Principia Editora, Estoril

Schiefer, Ulrich; Teixeira, Paulo Jorge e Monteiro, Susana (2006). MAPA - Manual de Facilitação para a Gestão de Eventos e Processos Participativos (Método aplicado de Planeamento e Avaliação). Principia Editora, Estoril

UNDP (2014). Sustentabilidade e Equidade: Um Futuro Melhor para Todos. Relatório de Desenvolvimento Humano. Programa das Nações Unidas para o Desenvolvimento, Washington

Ordenamento da Fauna Selvagem / Wildlife Management

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

1. Knows the ecology and population dynamics of terrestrial vertebrates and intervenes properly on its planning and management, considering their protection status. 2. Devise alternative planning and management adapted to the goals, the characteristics of the areas and the needs of the species. 3. Models and monitors the application of alternative planning and management, in order to their validation and their continuous improvement.

Syllabus:

Module 1. Wildlife. Concept, interactions with other natural resources and their uses. The need for planning and management. Nature Conservation, Hunting, Birdwatching and other activities. Wildlife vs. Agricultural and Forestry Systems. Management of conflict and measures to enhance wildlife. Population dynamics. Systematization of the problems of planning and population management. Quantification of populations. Existing methodologies. Indices, direct and indirect counts with capturing individuals. Software available. Module 2. Hunting management. Concepts and definitions. Topics for planning and management of populations of game species. Global Management Plans and modeling of populations. Recovery and management of Threatened Species. Concepts and particularities associated.

Bibliography:

- Beja, P., Borralho, R., Reino, L., Dias, S. e Carvalho, J. 2003. Culturas para a Fauna. ERENA, CEABN-ISA, ANPC.
- Bolen, E.G. e Robinson, W.L. 2002. Wildlife ecology and management. Prentice Hall. New Jersey.
- Braun, C.E. (ed.) 2005. Techniques for wildlife investigations and management. The Wildlife Society. Bethesda.
- Cabral, M.J. (coord.) 2006. Livro Vermelho dos Vertebrados de Portugal (peixes dulciaquícolas e migradores, anfíbios, répteis, aves e mamíferos). ICN, Assírio & Alvim.
- Cooch, E. & White, G. (Eds) 2014. Program MARK. A Gentle Introduction. 13th Edition.
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- Thomas, L., Buckland, S.T., Burnham, K.P., Anderson, D.R., Jeffrey, L. 2002. Distance sampling. pp 544–552 in Laake, D. & Strindberg, S. Encyclopedia of Environmetrics. John Wiley & Sons.
- Sinclair, A., Fryxell, J., e Caughley, G. 2006. Wildlife Ecology and Management. Blackwell.