



## Study Plan

**School:** School of Sciences and Technology  
**Degree:** Master  
**Course:** Management and Conservation of Natural Resources (cód. 624)

### 1st Year - 1st Semester

| Component code | Name   | Scientific Area Field                                  | ECTS | Duration | Hours |
|----------------|--|--|------|----------|-------|
| BIO8101        | Management and Ecology of Animal Populations   | Biology  | 6    | Semester | 162   |
| ECN12135       | Environmental and Natural Resource Economics   | *** TRANSLATE<br>ME: Ciências Económicas e Sociais *** | 6    | Semester | 162   |
| BIO8100        | Design and Analysis of Experiments in Ecology  | Biology  | 6    | Semester | 162   |
| BIO8103        | Management and Conservation of Terrestrial Plant Communities and Agro-Forestry Systems | Biology  | 6    | Semester | 162   |
| BIO8104        | Soils and Resources Conservation   | *** TRANSLATE<br>ME: Ciências da Terra ***             | 6    | Semester | 162   |

### 1st Year - 2nd Semester

| Component code | Name   | Scientific Area Field | ECTS | Duration | Hours |
|----------------|--|-----------------------|------|----------|-------|
| PAO12136       | Space Analysis   | Geosciences           | 6    | Semester | 162   |
| BIO8097        | Management and Conservation of Terrestrial Fauna         | Biology               | 6    | Semester | 162   |
| BIO8098        | Estuarine Management and Conservation                    | Biology               | 6    | Semester | 162   |
| BIO8099        | Management and Conservation of Coastal Marine Ecosystems | Biology               | 6    | Semester | 162   |
| BIO8096        | Management of Fisheries and Game                         | Biology               | 6    | Semester | 162   |

### 2nd Year - 3rd Semester

| Component code | Name  | Scientific Area Field                                  | ECTS | Duration | Hours |
|----------------|---|--|------|----------|-------|
| BIO8105        | Ecotourism and Enhancement of Natural Resources | *** TRANSLATE<br>ME: Ciências Económicas e Sociais *** | 6    | Semester | 162   |
| BIO8106        | Management and Conservation of Inland Waters    | Biology  | 6    | Semester | 162   |
| BIO12137       | Seminar I                                       | Biology  | 1.5  | Semester | 40    |
| BIO12138       | Seminar II                                      | Biology  | 1.5  | Semester | 40    |
| Dissertation   |   |  |      |          |       |

### 2nd Year - 4th Semester

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|----------------|------|-----------------------|------|----------|-------|
| Dissertation   |      |                       |      |          |       |



## Conditions for obtaining the Degree:

\*\*\* TRANSLATE ME: Para obtenção do grau é necessário a aprovação (através de avaliação ou creditação) das seguintes unidades curriculares:

1º ANO

1º Semestre:

5 UC obrigatórias num total de 30 Ects

2º Semestre:

5 UC obrigatórias num Total de 30 Ects

2º ANO

3º Semestre

4 UC obrigatórias num total de 15 Ects

Para obtenção do grau é necessário também a aprovação em Dissertação, no total de 45 ECTS, no 3.º e 4.º Semestre.

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### **Management and Ecology of Animal Populations (BIO8101)**

Definition of populations. Abiotic and biotic factors, density-dependent or density-independent, direct or indirect. Sampling and monitoring methods. Life cycles and life tables. Survivorship analysis. Demographic strategies. Processes of population regulation. Intra-specific relationships: cooperation, reproduction, competition. Effects of reproductive isolation, on the genetic structure of populations. Population growth models, density-independent and density-dependent. Stochastic mechanisms. Age structure models, Leslie matrix. Inter-specific relationships. Inter-specific competition and its modeling. Predation: Prey selectivity; optimal foraging; functional and numerical responses to prey density. Predator-prey models. Parasitism and parasitoidism. Host-parasite interactions, evolution of resistance and virulence. Co-evolution. Animal population management: Sustainable harvesting; conservation and meta-population theory; pest management, management of invasive species.

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### **Design and Analysis of Experiments in Ecology (BIO8100)**

- Logical concept of experiments: from observations to the interpretation of experiments.  
- Common problems in bad-designed experiments: lack of replication; lack of controls; pseudo-replication in space and time; confounding experiments; lack of independence.

Univariate studies

-Control experiments in the laboratory, manipulative and observational studies in the field that integrate spatial and temporal variability in different scales, using analysis of variance (multifactorial ANOVA, orthogonal and nested designs, fixed and random factors).

Multivariate studies (e.g. patterns of community structure) using: Classification and ordination techniques applied to biological and environmental data; Tests of multivariate hypotheses; Relation between multivariate biological and environmental patterns.



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### **Management and Conservation of Terrestrial Plant Communities and Agro-Forestry Systems (BIO8103)**

Module 1: Bioclimatic and biogeographic context of Portuguese vegetation; methods of vegetation study.

1. Bioclimatology and biogeography: history and concepts;
2. Biomes;
3. Methods of vegetation study.

Module 2: Vegetation conservation and plant mapping.

1. Plant mapping;
2. Biodiversity, vegetation management and conservation;
3. International Conventions, European Regulations, agri-environmental and forest-environment measures.

Module 3: Agroforestry systems.

1. Concepts and typologies;
2. Hydrological balance and nutrient cycling;
3. Silvopastoral systems: community rural areas as a case study.

Module 4: Restoration and rehabilitation of vegetation and plant communities.

1. Degradation factors;
2. Restoration methods; Phytoremediation;
3. Case studies (riparian galleries; wild fires; weed control; sand dunes; phytoremediation)

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### **Soils and Resources Conservation (BIO8104)**

The importance of soil for terrestrial ecosystems. Functions of soil on resources management. The soil as the subsystem necessary to life and environmental regulation. General processes of soil genesis and evolution. The soil, transformation of residuals and nutrient cycling (geochemical and biological nutrient cycles). Organisms and soil ecology. Soils and global changes. Mineral and organic soil constituents: nature and soil functions. Constitution and architecture of soil: retention and flux of fluids, nutrients and substances. Soil and the hydrological cycle. Use and misuse of soils, degradation. Secondary acidification and alkalinity. Soils physical degradation. Erosion and conservation measures. The soil and the chemical pollution, mineral and organic contaminants. The soil and extreme events, drought and fire. Restoration of soils and substrates.

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### **Space Analysis (PAO12136)**

- 1 - Representações Geográficas: Metáforas de representação e uma introdução à aproximação sistémica das metáforas de representação
- 2 - Modelos de dados espaciais: Análise detalhada do modelo vectorial, modelo raster e outros modelos de dados.
- 3 - Operações numa só camada espacial : Análise de vizinhança, áreas envolventes, filtros e máscaras
- 4 - Operações em múltiplas camadas espaciais: Análise de sobreposição e operações de geoprocessamento.
- 5 - Dimensionalidade dos dados geográficos: Modelos tridimensionais e introdução à modelação do tempo.
- 6 - Concepção de modelos de dados espaciais e modelação geográfica: Conceitos e desenho de fluxogramas de modelação geográfica incluindo álgebra de mapas..
- 7 - Análise de redes: Análises de caminho mais curto, áreas de serviço e distância custo.
- 8 – Perspectivas futuras: Novos modelos de dados, novos modelos de relações espaciais e novos processos de análise espacial



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### **Management and Conservation of Terrestrial Fauna (BIO8097)**

Communities and ecosystems: interactions and disturbances.

Fauna of urban areas: damages and benefits.

Management of agro-ecosystems for wildlife conservation.

Management of invasive species and exotic fauna.

Breeding in captivity and restoring animal.

Plans for control and eradication of exotic species.

Plans for maintenance and recovery of priority native species

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### **Estuarine Management and Conservation (BIO8098)**

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### **Management and Conservation of Coastal Marine Ecosystems (BIO8099)**

Patterns of community structure, and of abundance and distribution of benthic and pelagic species of marine shores. Physical (wave exposure, tides, coastal upwelling) and biological (predation, herbivory, competition, facilitation) processes and their interaction. Primary and secondary productivity, and trophic relations. Reproduction, settlement and recruitment.

Evolution of marine sedimentary environments and first animal living forms on Earth. Morphodynamic processes on rocky and sandy marine shores. Geosphere-Biosphere interactions on marine shores.

Human disturbances: fisheries, pollution, alterations in physical habitat, introduction of exotic species, climate change. Management and conservation of marine shores and their resources: objectives, strategies and threats. Marine protected areas: selection, designation and management.

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### **Management of Fisheries and Game (BIO8096)**

1. Principles of the management of game and inland fisheries. Regulation concerning game and inland fisheries. Legislation concerning coastal fisheries. Control of hunting activity and fisheries.

2. Main Portuguese halieutic resources. Fishing technology used in Portugal. Assessment and monitoring of halieutic resources. Impact of fisheries in the aquatic ecosystems. Fisheries management and mitigation measurements. Characterization of the agents and fishing instruments in inland fisheries. Restocking. Habitat manipulation.

3. Game species and hunting techniques. Bioecology, fenology and conservation status of game species. Problems related to the game management in agricultural zones, forestry and wetlands. Predator control. Management of habitats and hunted species. Management of migratory game species.

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### **Ecotourism and Enhancement of Natural Resources (BIO8105)**

1. Criteria and context of ecotourism: Emergence of ecotourism; Definitions and criteria; Ecotourism and other tourism types.

2. Ecotourism consumers: Emergence of a new environmental paradigm? Ecotourists: sociodemographic criteria; motivations and activities; attitude and behaviour; Ecotourism markets.

3. Ecotourism environments and nature conservation: Public and private protected areas; and protected areas classification: IUCN and Portuguese classification; Heavily modified spaces: agricultural land, urban spaces.

4. Ecological impact of ecotourism: Positive and negative impacts; Impact management strategies; Conflict and cooperation in natural resources management

5. Economic and sociocultural impact of ecotourism: Positive and negative impacts; Community-based ecotourism; Ecotourism in the rural European context.

6. Ecotourism as a business: Structure and agents of ecotourism activities; Business planning and managing; Quality control: codes of conduct and certification.



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### **Management and Conservation of Inland Waters (BIO8106)**

Part I- Abiotic freshwater scenarios. Major and minor components, water quality. Thermal stratification. Flora and fauna of the freshwater environment. Organic matter and its cycling. Typology and ecology of aquatic communities in rivers and lakes, temporal and trophic variability. Ecology of freshwater fishes.

Part II- Water quality and biotic integrity of freshwater ecosystems. Eutrophication and its control in rivers and reservoirs. Regulated rivers, ecology and management. Minimal flow requirements. Fish passes and fish movements. Ecology and management of riparian woodlands. Ecology and control of invasive species. Mining and substrate extraction. Habitat restoration in mining areas. Ecology of urban rivers. Restoration of aquatic systems, rivers and reservoirs.