**COURSE OUTLINE**

# GENERAL

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| **SCHOOL** | HEALTH SCIENCES | | | | |
| **ACADEMIC UNIT** | DEPARTMENT OF BIOLOGICAL APPLICATIONS AND TECHNOLOGY | | | | |
| **LEVEL OF STUDIES** | UNDERGRADUATE COURSE | | | | |
| **COURSE CODE** | **ΒΕΥ505** | **SEMESTER** | | **5th** | |
| **COURSE TITLE** | BIODIVERSITY AND CLIMATE CHANGE | | | | |
| **INDEPENDENT TEACHING ACTIVITIES** | | | **WEEKLY TEACHING HOURS** | | **CREDITS** |
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| **COURSE TYPE** | GENERAL BACKGROUND | | | | |
| **PREREQUISITE COURSES:** | - | | | | |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | GREEK | | | | |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | ENGLISH | | | | |
| **COURSE WEBSITE (URL)** | <http://ecourse.uoi.gr/course/view.php?id=456> | | | | |

# LEARNING OUTCOMES

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| **Learning outcomes** |
| The course is offered to students in order to develop their general cognitive background, and to develop their critical thinking on key ecological issues that are directly related to the planet's situation and our society. The expected learning outcomes are categorized in terms of knowledge acquisition and comprehension (K), as well as abilities of synthesis (S), analysis (A), evaluation (E) and application (AP). The student is expected after the end of the course to be able to:  Α. THEORY (LECTURES)   * Analyze the complex concept of biodiversity at its individual levels * Describe and re-create the concept of biodiversity with concrete examples for any ecosystem of the world * Evaluate and criticize the methods of estimating the global number of species in terms of their validity * Recognize the biomes of the planet and understand the basic ecological mechanisms shaping them * Describe and analyze the value of biodiversity and link it to sectors of human well-being * Understand the concept of the global ecological crisis and to substantiate its existence by combining and compiling modern scientific data * Know in depth the basic ecological mechanisms that regulate biodiversity distribution patterns at different scales * Interpret the spatial distribution patterns of the species with respect to these ecological mechanisms, in a synthetic and combinative manner * Know the key mechanisms of climate regulation on a global and local scale * Support the existence of climate change and its anthropogenic origin, by combining and compiling scientific data * Distinguish the root causes of climate change through the knowledge of the relevant biochemical cycles (C, CH4, N) * Link climate change with a range of impacts on the environment, society and economy * Develop a critical thinking about the scenarios on the world's climatic future   Β. LABORATORY  Be familiar with the basic monitoring methods of the wildlife fauna populations, as well as with the difficulties of setting up a sampling design in field studies.   * Present in tabular form the methodology used in any scientific publication * Produce a database in excel using any data in any form, in a way that the database can be treated in statistical terms * Merge different databases, produce new data matrices and calculate useful statistics by using automatic functions in excel (e.g vlookup, pivot table) * Use softwares such as EstimateS or PAST * Calculate a suite of indices that estimate the real number of species out of samples and to evaluate sampling effort adequacy [Chao indices]. * Calculate all the main diversity indices for any ecological community [Species richness (S), Weighted species richness (WS), Shannon index (H’), Simpson reciprocal index (1/D), Evenness indices of Pielou (J’) and Simspon (E)] * Interpret his/her results, by knowing how diversity indices work. * Present his/her research findings in tabular form, similar to the tables in scientific publications.   C. PROJECT   * Know the range of the climate change impact, focusing on Greece * Develop a critical thinking, evaluate, organize, and compile existing scientific information * Use the international bibliographic databases (ISI, Scopus) and correctly cite references in text * Produce a presentation using technological tools (power point or presence) * Communicate and support its opinion in the broad public * Work in a team and evaluate the contribution of each partner to the final deliverable * Be familiar with the environment of international congresses (simulation)   D. EDUCATIONAL EXCURSION   * Be familiar with the mountainous ecosystems of Epirus and be introduced in the main challenges of managing protected areas |
| **General Competences** |
| * Search for, analysis and synthesis of data and information, with the use of the necessary technology * Working independently * Team work * Applying knowledge in practice * Working in an interdisciplinary environment * Respect for the natural environment * Decision-making * Production of free, creative and inductive thinking * Communicative skills for public outreach and/ or debate skills |

1. **SYLLABUS**

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| **THEORY**   1. **Biodiversity: the wealth of life** 2. **Biodiversity**: Definition, levels and characteristics, global biodiversity assessment, problems and uncertainty of estimating the number of species on Earth 3. **Biomes**: Recognizing the world's terrestrial, aquatic and oceanic biomes, their ecological characteristics and their main anthropogenic pressures. Environmental factors shaping them- the role of the climate. 4. **Biodiversity value and loss:** Goods and services linked to biodiversity, intrinsic value of biodiversity. Ecological crisis, expected natural responses to biodiversity loss \* 5. **What creates biodiversity? Basic regulating mechanisms of species richness.** Community: share of available resources among species. Ecological mechanisms versus spatial scale: productivity-energy hypothesis, evolutionary time hypothesis, heterogeneity hypothesis, climatic stability, medium-disturbance hypothesis, environmental change hypothesis, theory of island biogeography and theory of competition-predation. 6. **Mapping biodiversity: species diversity patterns.** Species richness gradients in terms of latitude, altitude, depth. Ecological succession. Harsh environments. Biodiversity in marine and terrestrial realms. Peninsula phenomenon. Biodiversity hotspots. Interpreting species richness patterns though ecological mechanisms, management implications.   **Β. Ecology & climate change**   1. **Global climate:** Main mechanisms defining global climate, seasonality, local climate. Global climatic maps and their evolution in time. 2. **Understanding climate change through bio-geochemistry:** Evidence-based documentation of climate change. Greenhouse gases and their contribution to climate change. Cycle of carbon dioxide, methane, and nitrogen: sources of emissions, storage mechanisms, feedback mechanisms that accelerate global warming. Contribution of biomes to attenuate climate change. The climatic future of the World and of Europe in 2100 - Energy Uncertainty. 3. **Impact of Climate Change:** Impactof global warming on the atmosphere, ice cover, oceans, coastal and freshwater ecosystems. Impact on biodiversity and humanity   **LABORATORY**   1. Monitoring methods of wildlife populations: field research and databases \*\* 2. Management of databases (case study : the birds of Pindos National Park) 3. Diversity assessment (EstimateS , PAST freeware): Species accumulation curve, non parametric indices Chao, Species richness (S), Weighted species richness (WS), Shannon index (H’), Simpson reciprocal index (1/D), Evenness indices of Pielou (J’) and Simspon (E)   \*Since 2020 the Laboratory is taught remotely, promoting the independent study / self-education of students using detailed instructions / laboratory booklet and further supported with physical meetings for problem solving**.**  **EDUCATIONAL EXCURSION\*\***  Educational excursion to Northern Pindus National Park (Vovousa) and/or in other protected area.  **PROJECT\*\***  Various topics in the field of biodiversity conservation and impact of climate change on biodiversity and humanity.  \*\*: Optional |

1. **TEACHING and LEARNING METHODS - EVALUATION**

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| **DELIVERY***.* | Face-to-face |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY** | Use of ICT in **teaching**: power point with integrated audiovisual material and international links.  Use if ICT in **laboratory education:** use of excel and free statistical software.  Use if ICT **communication with students**   * Communication through e-course platform * Teaching: uploading lectures (pdfs), aim of the lecture, questions, and links/ references for further reading in each lecture * Laboratory: uploading laboratory notes, databases, software, and guideline for writing lab works. * Project: uploading aim of the project, guidelines, references, and international links |
| **TEACHING METHODS** | |  |  | | --- | --- | | ***Activity*** | ***Semester workload*** | | Lectures | 35 | | Laboratory practice | 35 | | Interactive teaching | 10 | | Independent study | 70 | | Project | 30 | | **Total** | **180** | |
| **STUDENT PERFORMANCE EVALUATION** | **Informing student:** Informing on the process and criteria used in student evaluation in the first lecture of the course.  **Evaluation language:** Greek. English (Erasmus)  **Theory (100%)**  Written final exam that includes:   * Short-answer questions, * Combinative questions of critical thinking   **Lab: 0%**  Evaluation of team lab exercises. Grade: YES/NO.  Evaluation criteria:   * Problem solving and software use - 60% * Structure and content of answers: - 40%   **Project: adding +30% in grade(bonus)**  Evaluation criteria  Written report - 50%   * Covering the main issue of the subject within word limit - 15% * Writing [ structure- wording – concise text) -15% * Number and relevance of bibliographic sources used– 10% * Delivering date (before deadline)– 5% * Adequate integration of citations -5%   Public presentation – 50%   * Covering the main issue of the subject within time limit 15% * Structure and aesthetic quality of the presentation– 15% * Knowledge and communication skills of the presenter– 15% * Delivering date (before deadline)– 5%   **\*Course evaluation:** Course evaluation (lectures, lab, project, professor) via online questionnaire (surveymonkey). |

1. **ATTACHED BIBLIOGRAPHY**

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| 1. Begon, M., Howarth, R.W., Townsend, C.R. (2005). « Ecology: From Individuals to Ecosystems, 4th Edition. Wiley-Blackwell. 750 pages. ISBN: 978-1-405-11117-1 2. Gaston, K.J., Spicer, J.I. (2012). «Biodiversity: an introduction». Malden, Mass. Blackwell Publ ISBN: 9781405118576 1405118571 3. European Environmental Agency 2017. Climate change, impacts and vulnerability in Europe 2016. An indicator-based report. <https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016> 4. IPCC- Intergovernmental Panel of Climate Change (2014). Climate Change 2014, Synthesis Report. <http://www.ipcc.ch/> 5. <http://www.bankofgreece.gr/Pages/el/klima/relevant.aspx>   \*\* Further citations and links are provided in every lecture. |