COURSE OUTLINE

(1) GENERAL

UNIVERSITY / Department	• NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS / Department of History and Philosophy of Science		
STUDY LEVEL	Postgraduate		
COURSE CODE	??	**SEMESTER OF STUDY**	2nd
COURSE TITLE	Philosophy of Biology and the Life Sciences		
INSTRUCTOR(S)	Stavros Ioannidis		
TEACHING ACTIVITIES	**TEACHING HOURS PER WEEK**		**ECTS**
Seminars	3		10
COURSE TYPE	specialization, skills development		
PREREQUISITE COURSES	–		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English		
COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	TBA		

(2) LEARNING OUTCOMES

Learning Outcomes

The main aim of the course is to introduce students to the central concepts and problems of contemporary philosophy of biology and more generally to the philosophical questions raised by modern life sciences. Upon successful completion of the course, students will be able to:

- identify the main debates and controversies in contemporary philosophy of biology
- explain the central concepts to be studied in the course
- critically analyse the various philosophical views and arguments in philosophy of biology
- read, understand and critically analyse philosophical and scientific articles on issues in philosophy of biology
- form their own views and arguments
- present in class an analysis of a philosophical account of a main issue in philosophy of biology
- compose a philosophical essay

General Skills

- Critical Thinking
- Independent work
- Team work
- Work in an international environment
- Work in an interdisciplinary environment

- Generating new research ideas

(3) COURSE CONTENT

Philosophy of Biology and the Life Sciences

General Description:
The aim of the course is to systematically study the central problems of the philosophy of biology. We will study conceptual issues that arise within the life sciences (the levels of selection, the concept of function, of biological species, of the gene, of genetic information etc), more general issues in the philosophy of science applied to the life sciences (e.g. explanation, reduction, causality), as well as philosophical questions that arise from the application of the evolutionary way of thinking to traditional philosophical problems (e.g. human nature, mind, ethics).

Weekly Schedule:
1 Introduction
What is philosophy of biology? Philosophy of biology as a branch of general philosophy of science, and as the study of conceptual and theoretical issues in modern biology. Relationship between philosophy of biology and other branches of philosophy (metaphysics, philosophy of mind, epistemology). Brief overview of the history of biology with emphasis on the Darwinian revolution, the creation of Modern Synthesis, and the development of molecular biology. Introduction to major biological concepts: evolution, natural selection, adaptation, gene, organism.

2 Evolution and natural selection
The structure of Darwin's long argument in *Origin of Species*, the evidence for evolution, and the theory of natural selection in Darwin and neo-Darwinism: Lewontin's characterisation, the concept of fitness and the tautology problem. Origin explanations vs distribution explanations. The concept of the adaptive landscape. What exactly does it mean for a character to be an adaptation? Adaptive traits vs adaptations. Natural selection explanations vs creationist explanations of adaptations.

3 Adaptationism and niche construction
The 'Panglossian Paradigm', the notion of a spandrel and Gould & Lewontin's critique of adaptationism; kinds of adaptationism and kinds of non-adaptive explanations of evolution; the notion of constraints; niche construction theory as a new way of looking at the relationship between organisms and the environment. Can an adaptationist hypothesis/the adaptationist programme be falsified?

4 Teleological concepts in biology
The place of teleological notions in modern biology. Does the theory of evolution through natural selection show that these notions should be eliminated from biology? The distinction between accidents and function and recent theories of function and functional explanation. Is reference to function always an indirect reference to evolutionary history? The distinction between adaptation and exaptation. The concept of agency.

5 The units of selection and the gene's-eye view of evolution
Does selection act only on individuals, or can it also act at lower levels (e.g. genes) as well as at higher ones (e.g. group, species)? Williams' critique of group selection and Dawkins' gene's-eye view of evolution. Kin selection, contemporary views on group selection, realist vs. anti-realist views on units of selection and Maynard Smith and Szathmáry's framework of the major transitions in evolution.

6 Organisms and biological individuals
What conditions must be met for something to be a biological individual? We will start with traditional philosophical theories on individuality and then focus on recent theories of biological individuality. Questions to be examined: What is the relationship between organisms and Darwinian individuals? Can parts of organisms constitute Darwinian individuals? Are groups of organisms (e.g. assemblages of bacteria) biological individuals? The evolution of biological individuality.

7 Biological species and higher taxa
What exactly are biological species has been a contentious issue among biologists and philosophers since the time of Darwin (and even earlier). We will examine some central species concepts, as well as various philosophical issues raised by the plurality of species concepts we find in modern biology (realist vs. anti-realist views, pluralist vs. monist views). Central questions to be examined: What kind of entities are biological species, sets, natural kinds, individuals or something else? Do species have essences? What is the ontological status of the tree of life, and what is its relation to the species concept? What is population thinking? We will also examine philosophical issues concerning higher taxa.

8 The concept of the gene
The concept of the gene has been the most important concept of biology during the past century. Central aspects of classical and molecular genetics will be discussed, as well as the plurality of gene concepts in modern biology and the historical sources of each concept. Issues to be examined: the relationship between genes and genetic causation; theories of heredity before and after the early 20th century; the relationship between genes and development; recent views on genetic causation; the relationship between genes and epigenetics.

9 Reductionism in biology
Nagelian reduction and attempts to apply it to the case of the relationship between classical and molecular genetics. Contemporary views of ontological reductionism: are biological facts reducible to chemical or physical facts? The historical controversies between mechanists, vitalists and organicists. Is mechanistic explanation a form of reductionist explanation?

10 Genetic information
How should the concept of biological information be understood? Shannon's theory of information, teleosemantics and other views on biological information. The concepts of the genetic code and the genetic programme; biological communication. Do such concepts point to a deeper distinction between the life sciences and sciences such as physics and chemistry?

11 Biological laws and mechanisms
Are there biological laws, and if yes, are they similar to laws in physics? Is biology a different kind of science from sciences like physics and chemistry (perhaps because of its historical character)? Recent views on the existence of laws in biology; the nature of explanation and prediction in historical sciences such as evolutionary biology; the place of mechanisms in biology. What is the relationship between laws and mechanisms? Do mechanisms make laws redundant? Complexity and its relationship to mechanisms and biological laws; the concept of evolutionary progress; the concept of life.

12 Evolutionary explanations of social behaviour
How can altruism emerge from the interactions of selfishly behaving organisms? Sociobiology and evolutionary explanations of cooperative behaviour in humans and other organisms. Evolutionary game theory and theories of the evolution of cooperation in human societies.

13 Cultural evolution and human nature
Can psychological and cultural phenomena be explained evolutionarily? Evolutionary psychology and its relationship with sociobiology; universal Darwinism; theories of cultural evolution. The relationship between evolution and ethics and the implications of evolutionary biology for the question of whether there is a 'human nature'. Should an evolutionary theory of human behavior adopt genetic determinism? Is the mind 'massively modular', as evolutionary psychologists claim? Should we expect that we have Stone Age minds today?

Final Paper due: 4,500-5000 words

(4) TEACHING AND LEARNING METHODS – ASSESSMENT

<table>
<tr><td>TEACHING FORMAT</td><td>Lectures in class combined with discussion.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES</td><td>Use of the e-class online platform.</td></tr>
<tr><td>TEACHING STRUCTURE</td><td>
<table>
<tr><th>Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures, Seminars</td><td>39</td></tr>
<tr><td>Presentation preparation</td><td>21</td></tr>
<tr><td>Independent study</td><td>120</td></tr>
<tr><td>Project (paper preparation and submission</td><td>120</td></tr>
<tr><td>Total
(30 hours of work per credit unit)</td><td>300</td></tr>
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<tr><td>STUDENT EVALUATION</td><td>1. Presentation (20%)
2. Final essay (80%)</td></tr>
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(5) RECOMMENDED BIBLIOGRAPHY

Darwin, C. (1859) *On the Origin of Species* (first edition). (introduction, ch. 1-4, 6, 14) http://darwin-online.org.uk/content/frameset?itemID=F373&viewtype=text&pageseq=1

Griffiths, P.E. & K. Stotz (2013) *Genetics and Philosophy: an introduction*, New York: Cambridge University Press.

Godfrey-Smith, P. (2016) *Philosophy of Biology*, Princeton University Press.

Hull, D. L. & Ruse, M. (2017) *The Cambridge Companion to the Philosophy of Biology*, Cambridge University Press.

Rosenberg, A. & McShea, D. (2008) *Philosophy of Biology: A Contemporary Introduction*, Routledge.

Sober, E. (ed.) (2006) *Conceptual Issues in Evolutionary Biology*, Cambridge, Massachusetts: MIT Press.

Sterelny, K & Griffiths, P. (1999) *Sex and death: an introduction to philosophy of biology*, University of Chicago Press.