

## BIO 4200 -- EVOLUTION SYLLABUS Spring/Summer 2018

Time and Room: 0037 State Hall; 2:30-5 pm on Mon.-Wed.

Instructor: Dr. Aleksandar Popadić

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Office Hours: Immediately after the class (5-6 pm; room 3125 BioSci. Bldg.).

Date	Topic	Assigned Reading <sup>1</sup>
May 7 (M)	Evolutionary Thinking: The case of HIV	Chapter 1
May 9 (W)	The pattern of evolution	Chapter 2
May 14 (M)	Mutation and Genetic Variation Mendelian Genetics in Populations: I	Chapter 5 Chapter 6
May 16 (W)	Mendelian Genetics in Populations: I Origins of Life and Precambrian Evolution	Chapter 6 Chapter 17
May 21 (M)	Origins of Life and Precambrian Evolution <b>Test 1</b>	Chapter 17
May 23 (W)	The Cambrian Explosion	Chapter 18
<b>May 28 (M)</b>	<b>Memorial Day (no classes)</b>	
May 30 (W)	Estimating phylogenetic trees	Chapter 4
<b>June 1 (F)</b>	Estimating phylogenetic trees “Evo-Devo” Evolution and Development	Chapter 4 Chapter 19
June 4 (M)	“Evo-Devo” Evolution and Development <b>Test 2</b>	Chapter 19
June 6 (W)	Natural Selection <i>Chapters 3-4, “Origin of Species” (1<sup>st</sup> Edition)</i> <sup>2</sup>	Chapter 3 <i>“The Origin of Species”</i> <sup>2</sup>
June 11 (M)	<i>Chapters 3-4, “Origin of Species” (1<sup>st</sup> Edition)</i> <sup>2</sup> Studying Adaptation	<i>“The Origin of Species”</i> <sup>2</sup> Chapter 10
June 13 (W)	Studying Adaptation Mechanisms of Speciation	Chapter 10 Chapter 16
June 18 (M)	Mechanisms of Speciation Human Evolution	Chapter 16 Chapter 20
June 20 (W)	<b>Review Session</b> <b>Test 3</b>	
<b>June 25 (M)</b>	<b>Final EXAM</b> <b>2:30 – 4:00 pm</b>	

<sup>1</sup> Section numbers (s) refer to Freeman and Herron, *Evolutionary Analysis*, 5<sup>th</sup> Edition.

<sup>2</sup> We will read and discuss the first four chapters of the *1<sup>st</sup> Edition* of Charles Darwin’s “Origin of Species.” It is available as a facsimile edition (Belknap Press, Harvard University, with an Introduction by Ernst Mayr) at the WSU Bookstore **or online at: <http://www.talkorigins.org/faqs/origin.html>**.

**NOTE: The above is a provisional course syllabus. While a majority of the topics will indeed be covered according to this syllabus, additional topics may be added (depending on the progress of the course).**

## **Format of the class**

The class is taught in a highly interactive format, with students actively participating in the discussions of the particular issues or experiments. The primary source for studying is the textbook (Freeman&Herron, 5<sup>th</sup> edition), lectures are based completely on the textbook material.

### **Tests and a final exam will be a combination of an essay type and short answer questions.**

For essay questions, be prepared to:

- a) answer the basic question (know the material)
- b) apply/extend information asked in the basic question

**Be sure that you understand and are able to accurately draw any diagrams or figures that we covered in the class.**

### **Grading Policy:**

**There will be:**

**1) Three scheduled** in-class tests, which will be given throughout the semester

**2) One cumulative test (“final” exam)**, which can be used to either replace a test that you missed, or to replace your lowest scoring test. There will be 2 versions of this make-up test, covering either the first (Ch. 1, 2, 5, 6, 17, and 18) or the second half of the class (Ch. 3, 4, 10, 16, 19, 20, and “Origins of Species”).

Grades will be determined on the basis of the following scale: 90%+ = A; 80-89% = B; 70-79% = C; 60-69% = D; 59% or less = F. Tests will be destroyed at the end of the semester, hence any questions about the score obtained should be asked immediately after each exam.

**To reiterate, there will be no make-up tests during the semester – even due to medical reasons or any other emergencies.** Students may miss a test, but the points must be made-up by taking the make-up test.

### **TOPICS COVERED**

1. Microevolution versus macroevolution
2. The mechanism and consequences of natural selection
3. The relationship between genetic and phenotypic variation
4. Understanding organismal diversification as descent with modification
5. Using tree visualization to study and describe evolutionary relationships and ancestries
6. Reconstructing phylogenetic trees using molecular and morphological information
7. Defining homology at the phenotypic and molecular level
8. The impact of selection, genetic drift, migration, inbreeding, and mutation on genetic change at the population level
9. The neutral theory of molecular evolution and the molecular clock
10. The importance of genetic recombination for adaptive evolutionary change
11. The evolution of linkage disequilibrium
12. The diagnostic power of linkage disequilibrium to study genes under selection
13. Molecular approaches to detect selection
14. Quantitative genetic approaches to analyze the adaptive evolution of complex traits including the mapping of quantitative trait loci
15. Recent human population history and its impact on genome evolution
16. Recent adaptive changes affecting human populations at the genetic level

17. Evolutionary forces affecting genome evolution
18. Species concepts
19. Speciation modes
20. The role of developmental genes and mechanisms in body plan evolution, phenotypic plasticity and phenotypic robustness
21. The role of co-option and modularity in the evolution of organismal complexity
22. Sexual selection
23. Kin selection and evolutionary game theory based approaches to study the evolution of social systems
24. Behavioral evolution
25. Primate evolution and ancestral human traits
26. Cultural evolution

### ***LEARNING OBJECTIVES/OUTCOMES***

As a result of mastering the material in this course, you will be able to:

1. Understand and study the mechanisms underlying the diversification of viruses, microorganisms, and multicellular systems by means of natural selection
2. Infer phylogenetic relationships using structural and genetic data
3. Apply comparative approaches to analyze and study patterns of genetic, organismal and cultural diversification
4. Study adaptive processes using molecular genetic tests
5. Understand the complementary nature of theoretical, modeling, and experimental studies of evolutionary change
6. Understand the role of kinship and reciprocity in the evolution of cooperative behavior
7. Apply game theoretical thinking
8. Understand the evolutionary origin of gender differences
9. Recognize the multiple levels of evolutionary change that affect the human sphere
10. Apply evolutionary insights to the development of biomedical and public policy

### ***SPECIAL CONSIDERATIONS FOR INDIVIDUALS WITH DISABILITIES***

If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located in the Adamany Undergraduate Library. The SDS telephone number is 313-577-1851 or 313-202-4216 (Videophone use only). Once you are registered, someone can meet with you privately to discuss your special needs. Student Disability Services' mission is to assist the University in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University.

Students who are registered with Student Disability Services and who are eligible for alternate testing accommodations such as extended test time and/or a distraction-reduced environment should present the required test permit to the professor at least **one week in advance of the exam**. Federal law requires that a student registered with SDS is entitled to the reasonable accommodations specified in the student's accommodation letter, which might include allowing the student to take the final exam on a day different than the rest of the class.

### ***CHEATING POLICY***

(1) **Cheating will not be tolerated.** Students caught once cheating on an exam will receive zero points for that exam and will not be allowed to take the make-up exam. Students caught twice cheating on an exam will receive a final letter grade of F for the course.

(2) Absolutely no electronic devices (such as cell phones, instant messaging devices, calculators, etc.) are to be used during exams. Doing so will result in a zero grade for the exam.

(3) **Student identification cards will be checked during the exam and quizzes;** please bring your I.D. to each exam/quiz.