

**BIO 4200 -- EVOLUTION SYLLABUS**  
**Winter 2020**

*Time and Room: 1117 Science; 10:00-11:15am on Monday-Wednesday*

**Instructor: Dr. Aleksandar Popadić**

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Office Hours: Immediately after the class (11:15-12:15)

| <b>Date</b>       | <b>Topic</b>  | <b>Assigned Reading<sup>1</sup></b>   |
|-------------------|---|---|
| Jan. 6, 8, 13     | Evolutionary Thinking: The case of HIV                                      | Chapter. 1 (pp 3-30)  |
| Jan.15            | The pattern of evolution  | Chapter 2 (pp 37-67)  |
| <b>Jan. 20</b>    | <b>HOLIDAY (No classes)</b>   |   |
| <b>Jan. 22</b>    | <b>Test 1 (covering only Ch. 1)</b><br>The pattern of evolution             | Chapter 2 (pp 37-67)  |
| Jan. 27, 29       | Origins of Life and Precambrian Evolution                                   | Chapter 17 (pp 645-681)   |
| Feb. 3, 5, 10     | The Cambrian Explosion and beyond   | Chapter 18 (pp 691-730)   |
| <b>Feb. 12</b>    | <b>EXAM 1</b>   |   |
| Feb. 17           | Mutation and Genetic Variation  | Chapter 5 (pp 147- 174)   |
| Feb. 19, 24       | Mendelian Genetics in Populations I<br>Mendelian Genetics in Populations II | Chapter 6 (pp 179- 206)<br>Chapter 7 (pp 233-245)                                 |
| Feb. 26, March 2  | Estimating Phylogenetic Trees   | Chapter 4 (pp 109-141)  |
| March 4           | Natural Selection   | Chapter 3 (pp 73-104)   |
| <b>March 9-13</b> | <b>SPRING BREAK (no classes)</b>  |   |
| March 16          | <b>EXAM 2</b>   |   |
| March 18          | “ <i>The Origin of Species</i> ”  | Chapters 1-4, “ <i>Origin of Species</i> ” (1 <sup>st</sup> Edition) <sup>2</sup> |
| March 23, 25      | Evo-Devo” Evolution and Development   | Chapter 19 (pp 735-763)   |
| March 30, April 1 | Studying adaptation   | Chapter 10 (pp. 369-393)  |
| April 6, 8, 13    | Mechanisms of speciation  | Chapter 16 (pp 609-633)   |
| April 15          | Human Evolution   | Chapter 20 (pg 769-775)   |
| <b>April 20</b>   | <b>EXAM 3</b>   |   |
| <b>April 27</b>   | <b>MAKE-UP EXAM (8-10am)</b>  |   |

<sup>1</sup> Page numbers and 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 **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).**

## ***Learning Objectives/Outcomes:***

As a result of mastering the material in the 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
7. Understand the evolutionary origin of gender differences
8. Recognize the multiple levels of evolutionary change that affect the human sphere
9. Apply evolutionary insights for the development of biomedical and public policy

## ***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.

**Exams will be a combination of an essay type and short answers/multiple choice questions.**

For essay questions, be prepared to:

- a) answer the basic question (know the material)
- b) explain an application/extension of information asked in the basic question

**Be sure that you understand and are able to accurately draw any diagrams or figures that are part of the lecture material.**

## ***Grading Policy:***

**There will be three regular exams.** Individual make-up exams will not be given during the semester.

**However, there will be an optional make-up exam given during finals week.** This will be a **cumulative exam** that will include material from the **entire course material**. The make-up can be used to either replace an exam that you missed, or replace your lowest score on one of the 3 regular exams. **Note that the make-up score will be used even in the case that it is lower than the intended score you are trying to replace.**

**There will also be a single test (25min long). This test will cover only material in Ch. 1. Please note that there will be a no make-up test.**

Grades will be determined on the basis of the following scale: 100-92.6% A; 92.5-90% = A-; 89.9-87.5% = B+; 87.4-82.6% = B; 82.5-80% = B-; 79.9-77.5% - C+; 77.4-72.6% – C; 72.5-70% - C-; 69.9-67.5% - D+; 67.4-62.6% - D; 62.5-60% - D-; less than 60% - F.

Each exam will be scaled relative to the second highest score for the class on the exam. For example, if the highest score is 98% but the second highest is 95% of the possible points, in order to be in A-range you would need to score 90% of 95 or 85.5% of the possible points; a B-range would be a score between 80 and 90% of 95 or between 76% and 85.5 % of the possible points.

**To reiterate, there will be no make-up exams or tests during the semester – even due to medical reasons or any other emergencies.** Students may miss the exam, but the points must be made-up by taking the make-up exam, which will be given on the day of the finals.

## **Honors assignments/activities**

- 1) If a student enrolls in the honors section of a course, they will not be able to transfer to the non-honors section after two weeks following the start of the semester. If a student is unable to complete the work for the honors section during the semester that they have enrolled, they will be given the grade of Incomplete in the class. The student will have one year to finish the work and change their grade from incomplete to a letter grade. Failure to complete the honors section work in the one year period will result in a change from an incomplete to an F for the course.
- 2) Performance in honors activities/assignments will be assessed only as Passed or Failed. However, the Failed assessment will lower the student's final grade in the class, per instructor's evaluation.

**Credit requirement policy:** Note that prerequisite requirements as outlined below will be strictly enforced

## ***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

## ***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 exams and a test;** please bring your I.D. to each exam/test.