COURSE SUMMARY

EVOLUTIONARY CONCEPTS

(0-0;2-2)

Biology 3671 - 2019

Instructor:

Dr. Douglas Morris

Office: CB4017

Lab: CB3019

Text:

- Morris, D. W. and P. Lundberg. 2011. Pillars of Evolution. Oxford University Press, Oxford, UK.
- Morris, D. W. 2019. Biology 3671: Evolutionary concepts. Notes & Tutorials 2019.

Office Hours:

Monday & Tuesday 11:00-12:00 (7 January - 2 April 2019 only)

Other Times by Appointment

Lectures: Tuesday & Thursday 08:30-10:00 Room UC 0050.

Tutorials: As assigned by the registrar:

ALL STUDENTS MUST REGISTER FOR AND ATTEND TUTORIALS

BIOL 3671L W1 Monday: 08:30-10:20 CB 3010A; GA Haley MacLeod

BIOL 3671L W2 Monday: 10:30-12:20 CB 3010A; GA Kerman Bajina

BIOL 3671L W3 Wednesday: 08:30-10:20 CB 3010A; GA Haley MacLeod

BIOL 3671L W4 Wednesday: 10:30-12:20 CB 3010A; GA Kerman Bajina

BIOL 3671L W5 Friday: 08:30-10:20 CB 3010A; GA Haley MacLeod

ELECTRONIC DEVICES IN LECTURES AND TUTORIAL. Students are not allowed to take photographs, send or receive phone or text messages, use E-mail or social networks, download files, stream content, or surf the internet. Audio and video recording during lectures and tutorials is strictly prohibited unless permission is granted on an individual basis by the course instructor. All electronic devices other than notepads or laptops used to take notes, and calculators required for assignments and tutorials, must be left out of the room or turned off and located out of sight. No electronic devices other than calculators are allowed during quizzes. Students anticipating or sending urgent messages are expected to remain outside of the classroom.

BEHAVIOUR DURING LECTURES AND TUTORIALS. Students must respect the rights of others by conducting themselves at all times in a professional, polite, unbiased and civil manner. Students who disrupt others during lecture or tutorial will receive a grade deduction.

There may be one or more guest lectures during the course. GUEST LECTURES ARE AN INTEGRAL COURSE COMPONENT AND STUDENTS WILL BE EXAMINED ACCORDINGLY.

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Introduction:

This course is designed for the student who wants to understand evolutionary concepts and their application to important questions in biology. The course emphasizes the lock-step connection between evolutionary biology and ecology. Course instruction will include a mixture of lectures, general discussions, tutorials, and investigative assignments. Lectures will emphasize conceptual, empirical, and experimental approaches to the study of evolution. Students are expected to complete supplementary readings and assignments, and to participate fully in tutorials. Lectures and tutorials are integrated to provide a single cohesive body of instruction.

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Course Outcomes and Assessments:

1. Students will learn to think like evolutionary biologists by identifying a series of evolutionary themes for thorough evaluation. Groups of students will work together weekly during supervised tutorials to address each theme, then use theory and examples to explain them in an end-of-term Powerpoint presentation to the class.

2. Students will gain command of a broad array of relevant and contemporary issues in the study of evolution through assigned and recommended readings merged with weekly quizzes and written tutorial assignments that evaluate knowledge and assess student abilities at independent thought and scholarship.

3. Students will gain evolutionary literacy in essential concepts, theories and models through lectures and assigned readings assessed with weekly quizzes that evaluate student progress and command of concepts with short-answer and problem-solving exercises. Judicious application of rigorous and clear quiz rubrics will yield consistent, repeatable and objective evaluations.

4. Students will be inspired to question and discuss current concepts in evolutionary biology through mandatory tutorial groups that submit weekly progress reports highlighting discussion points, new material and questions for future discussions, and timelines with clear milestones that ensure progress. Each student must submit a term report structured as an op-ed piece for a major Canadian newspaper. Students will receive the theme of the report, based on a recent national or international evolutionary news story, at the beginning of the term.

5. Students will develop the skills, discipline, and study habits necessary for self-instruction in this and other areas of biology by participating in tutorials structured to lead students logically along the pathway from identifying a problem to resolving it. Weekly written summaries will evaluate student progress and feedback will emphasize issues such as effective time management, critical questions for further consideration, relevant literature to be assessed, individual roles and responsibilities, and self-assessment of each student's contribution.

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Evaluation:

Weekly in-class quizzes - 60%. Tutorial assignments, participation, discussion, and reports - 25%. Final term report 15%.

Performance will be evaluated regularly. The evaluation will be based on the student's grasp of important issues, logical reasoning, non-trivial criticisms of the material, and the ability to solve evolutionary problems. Students are encouraged to share their ideas and their questions.

Written or oral reports may be assigned at intervals during the course. Evaluation of these reports will be based on the student's ability to synthesize a field of enquiry, to apply that synthesis to a particular problem, or to develop significant new insights into evolutionary issues. The reports should not, in general, be restatements of review papers. Rather they will require the student to apply what is known (and what is unknown) to an unresolved question. Evaluation will be devoted equally to clarity of presentation, rigour of treatment, and suitability of the report to the assignment.

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Report Format:

Read each assignment carefully and include only relevant material. Unless otherwise indicated, maximum length of reports including tables, figures, and references will be six typed pages (double-spaced, 2.5 cm margins, minimum height of lower-case letters 2 mm).

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Report Due Date:

All regular reports will be due either at the end of the tutorial, or as announced in lecture. Late submission will be penalized at the rate of 10 % per calendar day unless prior permission is received. The due date for the final report is 10:20 4 April 2019. ***Reports submitted after 4 April 2019 will not be accepted for grading.***

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Report Style:

Be concise. Use the active voice. Organize your thoughts before you begin writing. Omit needless or redundant words. Express your thoughts as clearly as possible even if it means re-writing the report. Write in your own words. Use quotations sparingly, and only when you cannot express the idea clearly yourself. Never borrow a phrase without quotations. Never repeat observations, interpretations, or ideas without proper citation. Never cite a reference that you have not read.

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FINAL TERM REPORT = TAKE-HOME ASSIGNMENT

Students may be given components of the final take-home report throughout the term. Students are encouraged to answer each component in a timely fashion. Submit the entire assignment as a single submission on or before the 4 April 2019 due date. Where possible, type the answer to each question or assignment (double-spaced, 2.5 cm margins, minimum height of lower-case letters 2 mm). The due date for the final report is 10:20 4 April 2019. *Reports submitted after 4 April 2019 will not be accepted for grading.*

Please note: The take-home term report is a term project and not a final examination. Students will be ineligible to write a special examination as outlined in general regulation VII in the Lakehead University Calendar.

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TUTORIALS:

Students are required to participate in weekly tutorials. Tutorials may consist of a mixture of problem sets, workshops, and assigned readings. Please ensure that you have completed the reading assignment before attending the tutorial.

Depending on length, the total assignment, or a random subset of each assignment, will be evaluated to complete the tutorial grade. When possible, we will use a peer-grading system where students correct one another's assignments.

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Tentative Timetable 2019

Jan. 8 & Jan. 10 Topic 1: The Evolutionary Paradigm

Jan. 15 & Jan. 17 Topic 2: Mechanics I: Chance vs Systematic Change

Jan. 22 & Jan. 24 Topic 3: Mechanics II: Beyond Mendelian Genetics

Jan. 29 & Jan. 31 Topic 4: Function I: Beyond Mechanics

Feb. 5 & Feb. 7 Topic 5: Function II: Mappings

Feb. 12 Special Guest Lecture: Dr. Douglas Haffner, U. Windsor

Feb. 14 Topic 6: Structure I: Evolutionary Games

Feb. 18 - Feb. 22 Family Day and Study Week - No Classes

Feb. 26 & Feb. 28 Topic 7: Structure I/II: Games and The Structure Matrix

Mar. 5 & Mar. 7 Topic 8: Scale I: Grain and Habitat Selection

Mar. 12 & Mar. 14 Topic 9: Scale II: Softness of Selection

Mar. 19 & Mar. 21 Topic 10: Dynamics 1: Evolutionarily Stable Strategies

Mar. 26 & Mar. 28 Topic 11: Dynamics II: Adaptive Dynamics

Apr. 2 Topic 12: Adaptation

Apr. 4 Class symposium: "Evolutionary Insights"

Apr. 4 Final Report Due: 15% of grade

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How to Study Evolution:

An understanding of evolutionary concepts is essential for all biologists. Some students have difficulty making the transition from rote learning to conceptual thinking. Others are confused on the difference between a clear understanding of concepts, often aided by mathematics, and arm-waving generalities. A vague understanding of evolution will lead, at best, to an even more vague understanding of biology. How, then, can students maximize their ability to learn evolutionary concepts?

Here are a few suggestions.

- **Form, or join, a study group.**
- **Supplement your lecture notes by annotating the figures and equations in your text.**
- **Redraw graphs, rewrite equations, and explain them to your study group.**
- **Review your lecture notes before you attend the next lecture.**
- **Make sure that you understand the mathematics, rather than memorizing equations or graphs.**
- **When confused, get help immediately from your study group, demonstrator or instructor.**
- **Ask yourself, and your study group, questions about the material rather than relying on quizzes to do that for you.**
- **Be an active participant in tutorial and classroom discussions.**
- **Try to imagine specific examples for each concept that you explore.**
- **Ask yourself at frequent intervals "how could I improve on or test this idea"?**
- **Never commit the "fallacy of complexity" by criticizing a model as too simple of a caricature of nature unless you have a clear and parsimonious alternative.**

- **Read Darwin's "On The Origin of Species by Means of Natural Selection" available on the web at http://darwin-online.org.uk/content/frameset?itemID=F373&viewtype=text&pageseq=1**

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