BIOL 2371 - Principals of Evolution
Department of Life Sciences
Spring 2017

A. COURSE INFORMATION
Course number/section: BIOL 2371
Class meeting time: 9:00 - 9:50 am MWF
Class location: EN 106
Course Website: https://bb9.tamucc.edu/

B. INSTRUCTOR INFORMATION
Instructor: Christopher E. Bird, Ph.D.
Office location: CS246
Office hours: MW 3:30-6
Telephone: 361-825-6024 (office), 361-443-5676 (cell)
e-mail: chris.bird@tamucc.edu (please message me through blackboard)
Appointments: arrange via blackboard

C. COURSE DESCRIPTION
Catalog Course Description
An overview of the structure and function of organisms in adapting to the environment. Provides a foundation for molecular, cellular, and organismal studies in the biological sciences.

Extended Course Description
Principals of Evolution - BIOL 2371 is a lower division lecture course that examines the foundations of evolutionary thought, explores the molecular mechanisms through which evolution occurs, presents a broad array of evidence supporting the theory of evolution in the form of scientific hypothesis testing, and explores the evolution of taxonomic diversity.

D. PREREQUISITES AND COREQUISITES
Prerequisites
BIOL 1407 pre-requisite required

Corequisites
none

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES
Required Textbook(s)
“‘Yes, you need to read the book” – Dr. Bird
Other Reference Material

“Yes, you will be tested on the additional reading materials” – Dr. Bird

• Additional reading materials will be provided through BlackBoard

Supplies

“Yes, you need to complete the EcoBeaker assignments” – Dr. Bird

• EvoBeaker (https://simbio.com/products-college/EvoBeaker)

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

This course is divided into four sections, each with five primary learning outcomes. Upon completion of Section I: Evolutionary Foundations, students will be expected to:

1. Explain what evolution is and why it is a science
2. Explain the historical development of evolutionary theory and the scientists not named Darwin that helps shape our present understanding of evolution
3. Describe the fossil record and why it is consistent with evolutionary theory
4. Use character traits to reconstruct evolutionary relationships
5. Describe how character traits are encoded and inherited.

Upon completion of Section II: The Molecular Machinery of Evolution, students will be expected to:

1. Explain the molecular underpinnings the neutral theory of molecular evolution and the theory of evolution via natural selection
2. Describe and employ mathematical models of neutral and selective evolution of traits encoded by one or several loci
3. Explain how random genetic processes result in the evolution of adaptive characters
4. Explain why quantitative traits are the result of Mendelian inheritance
5. Use heritable information encoded in DNA to estimate evolutionary history

Upon completion of Section III: Tests of Evolutionary Theory, students will be expected to:

1. Explain how and why thousands of tests of evolutionary models have led to evolution becoming a scientific theory, on par with heliocentrism, quantum theory, relativity, plate tectonics, gravity, information theory, etc…
2. Describe how adaptive traits arise and evolve
3. Explain the origins and describe the consequences of sexual reproduction
4. Describe how life history characteristics have evolved
5. Explain how evolution shapes behavior, such as sociality

Upon completion of Section IV: Evolution of Species Diversity, students will be expected to:
1. Describe what species are and explain how evolution results in new species
2. Describe the current evidence for the evolutionary history of apes and humans
3. Explain the processes leading to coevolution of species such as insects and flowering plants
4. Explain the applications of evolutionary theory to human health
5. Describe how evolution has shaped patterns of taxonomic diversity above the species level

G. INSTRUCTIONAL METHODS AND ACTIVITIES

The student learning outcomes in section F will be achieved through attending lectures, completing reading assignments and independent exercises. Note that reading assignments and exercises will address topics prior to them being discussed in lectures. They are due by 9am on the date they are assigned in the course schedule.

H. MAJOR COURSE REQUIREMENTS AND GRADING

The student learning outcomes in section F will be assessed through take-home assignments, one examination for each of the four quarters of the course, and a cumulative final examination. Exams will consist of multiple choice, T/F, and/or short answer at the instructor’s discretion.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take Home EvoBeaker Exercises</td>
<td>30</td>
</tr>
<tr>
<td>Exam 1</td>
<td>14</td>
</tr>
<tr>
<td>Exam 2</td>
<td>14</td>
</tr>
<tr>
<td>Exam 3</td>
<td>14</td>
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<tr>
<td>Exam 4</td>
<td>14</td>
</tr>
<tr>
<td>Cumulative Final</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

The scores on an exam will be adjusted if the class mean falls below 70% or if there are irregularities in the statistical distribution of test scores. Scores will not be reduced by an adjustment.
## I. COURSE CONTENT/SCHEDULE

### SECTION I: EVOLUTIONARY FOUNDATIONS

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Reading</th>
<th>Topic</th>
<th>Assignments Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18-Jan</td>
<td>ZE: Ch1</td>
<td>What is evolution?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20-Jan</td>
<td>ZE: Ch1, Dobzhansky 1973</td>
<td>Nothing in biology makes sense, except in the light of evolution</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>23-Jan</td>
<td>ZE: Ch2, Huxley: Ch1.1</td>
<td>The evolution of evolutionary thought</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25-Jan</td>
<td>ZE: Ch3</td>
<td>Fossil evidence of evolution 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>27-Jan</td>
<td>ZE: Ch3</td>
<td>Fossil evidence of evolution 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30-Jan</td>
<td>ZE: Ch4</td>
<td>Evolutionary reconstruction 1</td>
<td>EvoBeaker: Flowers &amp; Trees</td>
</tr>
<tr>
<td></td>
<td>1-Feb</td>
<td>ZE: Ch4</td>
<td>Evolutionary reconstruction 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-Feb</td>
<td>ZE: Ch4</td>
<td>Evolutionary reconstruction 3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6-Feb</td>
<td>ZE: Ch5</td>
<td>The nature of heritable information 1</td>
<td>EvoBeaker: Mendelian Pigs</td>
</tr>
<tr>
<td></td>
<td>8-Feb</td>
<td>ZE: Ch5</td>
<td>The nature of heritable information 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-Feb</td>
<td></td>
<td></td>
<td>Exam 1</td>
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</table>

### SECTION II: THE MOLECULAR MACHINERY OF EVOLUTION

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Reading</th>
<th>Topic</th>
<th>Assignments Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>13-Feb</td>
<td>ZE: Ch6, Kimura 1983: preface &amp; intro</td>
<td>The neutral theory of evolution</td>
<td>EvoBeaker: Sickle Cell Alleles</td>
</tr>
<tr>
<td></td>
<td>15-Feb</td>
<td>ZE: Ch6</td>
<td>=(Neutral theory/3) + (Natural selection/3)</td>
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</tr>
<tr>
<td></td>
<td>17-Feb</td>
<td>ZE: Ch6</td>
<td>Evolution via natural selection</td>
<td>EvoBeaker: Finches and Evolution</td>
</tr>
<tr>
<td>6</td>
<td>20-Feb</td>
<td>ZE: Ch7</td>
<td>Quantitative traits and evolution of phenotypes 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22-Feb</td>
<td>ZE: Ch7</td>
<td>Quantitative traits and evolution of phenotypes 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24-Feb</td>
<td>ZE: Ch7</td>
<td>Quantitative traits and evolution of phenotypes 3</td>
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</tr>
<tr>
<td>7</td>
<td>27-Feb</td>
<td>ZE: Ch9</td>
<td>Molecular phylogenetic evolutionary reconstruction 1</td>
<td>EvoBeaker: Domesticating Dogs</td>
</tr>
<tr>
<td></td>
<td>1-Mar</td>
<td>ZE: Ch9</td>
<td>Molecular phylogenetic evolutionary reconstruction 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-Mar</td>
<td>ZE: Ch9</td>
<td>Molecular phylogenetic evolutionary reconstruction 3</td>
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<tr>
<td>8</td>
<td>6-Mar</td>
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<td>Exam 2</td>
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### SECTION III: TESTS OF EVOLUTIONARY THEORY

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Reading</th>
<th>Topic</th>
<th>Assignments Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8-Mar</td>
<td>ZE: Ch8</td>
<td>Evidence of evolution via natural selection 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-Mar</td>
<td>ZE: Ch8</td>
<td>Evidence of evolution via natural selection 2</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>SPRING BREAK</strong></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>20-Mar</td>
<td>ZE: Ch10</td>
<td>Adaptation 1</td>
<td>EvoBeaker: How the guppy got its spots</td>
</tr>
<tr>
<td></td>
<td>22-Mar</td>
<td>ZE: Ch10</td>
<td>Adaptation 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24-Mar</td>
<td>ZE: Ch10</td>
<td>Adaptation 3</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>27-Mar</td>
<td>ZE: Ch11</td>
<td>Sex viewed through and evolutionary lens 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>29-Mar</td>
<td>ZE: Ch11</td>
<td>Sex viewed through and evolutionary lens 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>31-Mar</td>
<td>ZE: Ch12</td>
<td>Evolution of life history 1</td>
<td></td>
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<tr>
<td>11</td>
<td>3-Apr</td>
<td>ZE: Ch12</td>
<td>Evolution of life history 2</td>
<td></td>
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<tr>
<td></td>
<td>5-Apr</td>
<td>ZE: Ch 16</td>
<td>Evolution of behavior</td>
<td></td>
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<tr>
<td></td>
<td>7-Apr</td>
<td></td>
<td>Exam 3, Last Day to Drop</td>
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### SECTION IV: EVOLUTION OF SPECIES DIVERSITY

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Reading</th>
<th>Topic</th>
<th>Assignments Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>10-Apr</td>
<td>ZE: Ch13, Darwin 1872 Table of Contents</td>
<td>The Origin of Species 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12-Apr</td>
<td>ZE: Ch13, Darwin 1872 Introduction</td>
<td>The Origin of Species 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14-Apr</td>
<td>ZE: Ch13</td>
<td>The Origin of Species 3</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>17-Apr</td>
<td>ZE: Ch 17</td>
<td>Evolution of apes and humans</td>
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</tr>
<tr>
<td></td>
<td>19-Apr</td>
<td>ZE: Ch15</td>
<td>Coevolution 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>21-Apr</td>
<td>ZE: Ch15</td>
<td>Coevolution 2</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>24-Apr</td>
<td>ZE: Ch 18</td>
<td>Evolutionary medicine</td>
<td>EvoBeaker: The HIV Clock</td>
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<tr>
<td></td>
<td>26-Apr</td>
<td>ZE: Ch14</td>
<td>Macroevolution 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>28-Apr</td>
<td>ZE: Ch14</td>
<td>Macroevolution 2</td>
<td></td>
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<tr>
<td>15</td>
<td>1-May</td>
<td></td>
<td>Exam 4</td>
<td><strong>Final Exam: 8-10:30am</strong></td>
</tr>
<tr>
<td>16</td>
<td>10-May</td>
<td></td>
<td></td>
<td><strong>Final Exam: 8-10:30am</strong></td>
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</tbody>
</table>

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.
J. **COURSE POLICIES**

**Attendance/Tardiness**
Students are expected to attend lectures. If you are late, try to be discrete.

**Late Work and Make-up Exams**
It is important that work is completed by the due date. Assignments are due at 9 am on the dates indicated in the course schedule.

There are no make-up exams. If you are going to miss an exam for a university sanctioned function, you must let me know if the form of an email sent through BlackBoard as soon as you know you are going to miss it. We can then schedule an alternative time for the exam.

**Extra Credit**
Can be earned during exams at the discretion of the instructor.

**Cell Phone Use**
Cell phone use is allowed during lectures if its purpose is for learning about evolution. Silent mode. If cell phone use becomes disruptive, they will be banned.

**Laptop Use**
Laptop use is allowed during lectures if its purpose is for learning about evolution. If laptop use becomes disruptive, they will be banned.

**Food in Class**
Respect the rules of the building or the room. If food is allowed but becomes disruptive, it will be banned.

**Missed Exam**
If you are going to miss an exam for a university sanctioned function, you must let me know if the form of an email sent through BlackBoard as soon as you know you are going to miss it. We can then schedule an alternative time for the exam.

If you miss an exam for some other reason, it is critical that you contact me as soon as you realize you are going to miss it (generally before the exam begins), and we can discuss remedies.

**Participation**
If I ask a question and you think you know the answer, please answer. I welcome questions during the lectures.

**Others**
None
K. COLLEGE AND UNIVERSITY POLICIES

• Academic Integrity (University)
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

• Classroom/Professional Behavior
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

• Statement of Civility
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

• Deadline for Dropping a Course with a Grade of W (University)
  The grade of W will be assigned to any student officially dropping a course. Please consult with the instructor before you decide to drop to be sure it is the best thing to do. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Should dropping the course be the best course of action, visit the Office of the University Registrar for the Course Drop Form that must be submitted. No student is eligible to receive a W without completing the official drop process by this deadline. Please consult the Academic Calendar (http://www.tamucc.edu/academics/calendar/) for the last day to drop a course.

• Grade Appeals (College of Science and Engineering)
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading,
may appeal the final grade given in the course. The burden of proof is upon the student to

demonstrate the appropriateness of the appeal. A student with a complaint about a grade

is encouraged to first discuss the matter with the instructor. For complete details,

including the responsibilities of the parties involved in the process and the number of
days allowed for completing the steps in the process, see University Procedure

13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible

through the University Rules website at

http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science

and Engineering Grade Appeals webpage at

http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the

grade appeal process, students may contact the chair or director of the appropriate
department or school, the Office of the College of Science and Engineering Dean, or the
Office of the Provost.

• Disability Services

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that

provides comprehensive civil rights protection for persons with disabilities. Among other

things, this legislation requires that all students with disabilities be guaranteed a learning

environment that provides for reasonable accommodation of their disabilities. If you

believe you have a disability requiring an accommodation, please call (361) 825-5816 or

visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access

issues in the classroom or on campus, please contact the Disability Services office

for assistance at (361) 825-5816.

http://disabilityservices.tamucc.edu/

• Statement of Academic Continuity

In the event of an unforeseen adverse event, such as a major hurricane and classes

could not be held on the campus of Texas A&M University–Corpus Christi; this course

would continue through the use of Blackboard and/or email. In addition, the syllabus and class

activities may be modified to allow continuation of the course. Ideally, University facilities (i.e.,
emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However,

students need to make certain that the course instructor has a primary and a

secondary means of contacting each student.

L. OTHER INFORMATION

• Academic Advising

The College of Science & Engineering requires that students meet with an Academic

Advisor as soon as they are ready to declare a major. The Academic Advisor will set

up a degree plan, which must be signed by the student, a faculty mentor, and the
department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

GENERAL DISCLAIMER
I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.