Illinois Mathematics and Science Academy
A Pioneering Educational Community
Course Information Sheet – Spring 2018

Course Title

Evolution, Biodiversity and Ecology (EBE)

Instructor

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Course Description

This is a one-semester course that explores the diversity of living organisms and their interactions with each other and the environment. Students will investigate the biological species concept, mechanisms of evolution and speciation, causes of extinction, and patterns of biological diversity across geographic space and time. They will also study the varied ways that organisms interact with members of their own species, with different species, and with their physical surroundings. Some field trips and/or outdoor activities may be included as a part of this course.

Meeting Information

Days: A/C and B/D days
Time: Mods 5-6 (12:30-2:20)
Location: B108

Reading Materials

Selected readings from science journals, science magazines, books (including Zodiac by Neal Stephenson), the internet, and newspapers.

Essential Content (Major Concepts, Underlying Concepts, and Lab Activities)

The content of this course is centered on five major concepts: evolution, species, organismal interactions, biogeography, and extinction. Several underlying concepts are addressed within each of these major areas as identified below.

Part 1 – Evolution:

***Underlying Concepts*:**
Nature and Philosophy of Science
- Review of Theory, Law, etc.

Historical and Social Context
- Age of Darwin
- Controversies and conflicts over time
- Current context

Misconceptions
- Common misunderstandings

- Importance of scientific communication to the public
- Common Ancestry and Evidences
  - Physical structures; classifications of microorganisms, cell lines, and organisms
  - Bioinformatics and molecular evidence
- Mechanisms
  - Mutation: genetic basis in ribosomal RNA; evolutionary clock, HOX genes and developmental mutations
  - Natural Selection: directional, stabilizing, dispersive, sexual, kin selection
  - Genetic Drift: Founder effect
- Speciation
  - Biological species concept
  - Barriers to hybridization
- Population Dynamics
  - Hardy Weinberg Calculations and manipulations
  - Real world uses and predictions
  - Measuring impact of mechanisms on population genetics
- Evolution of Behavior
  - Genetic and environmental basis of behavior: including epigenetics
  - Modes of communication
  - Development in intelligence in multiple species (i.e. octopus/canine)
  - Human behavior

Part 2: – Ecology

- Species Interactions
  - Importance of Biodiversity
  - Types of interactions: predation, parasitism, etc
  - Evolutionary Connections
- Biogeochemical cycles
  - Energy Flow and Trophic Cascades
  - Interactions between biological and non-biological components
  - Biomagnification
- Ecosystems and Biomes
  - Global
  - US specific
  - Biogeography: specific focus on Island
- Extinctions
  - Earth's history over time
  - Current status of biodiversity and Ecosystem health

Part 3: Conservation

- Current status of biodiversity and Ecosystem health
  - Ecosystem disruptions and extinctions
  - Connection to the "human condition" including health, access to resources, etc on a global scale

Social Context
    Political influence and Regulation
    Public Perception
    Connections to Industry
Education and Awareness
    Information transmission about issues in the IL, the US and globally
Zodiac – Neal Stephenson
    Looking at conservation and ecology related issues in a specific biome (Boston area) through the lens of literature,

Standards of Significant Learning (SSLs) and Outcomes Addressed

This course helps students to develop skills and levels of understanding and proficiency in the following IMSA Standards of Significant Learning (SSLs):

- IB. Construct questions which further understanding, forge connections, and deepen meaning. *This is accomplished by addressing questions posed by the students and/or the instructor that relate specifically to reading assignments, lab activities, and/or field experiences.*
- IC. Precisely observe phenomena and accurately record findings.
  This is accomplished through laboratory activities and field experiences that both develop and challenge students' powers of observation.
- ID. Evaluate the soundness and relevance of information and reasoning.
  This is accomplished by applying careful analysis and critical thinking skills to assess the validity of conclusions and claims.
- IIA. Identify unexamined cultural, historical, and personal assumptions and misconceptions that impede and skew inquiry.
  This is accomplished by addressing popular misconceptions that students hold, especially with respect to topics such as the nature of science and evolution.
- IIIB. Recognize, pursue, and explain substantive connections within and among areas of knowledge.
  This is accomplished by exploring topics and concepts that are integrative in nature and are enriched by data, observations, and information from various fields and disciplines (e.g., biogeography).
- IVA. Construct and support judgments based on evidence.
  This is accomplished by supporting inferences and conclusions with observations and data analyses, including the use of statistics.
- IVB. Write and speak with power, economy, and elegance.
  This is accomplished through student presentations, class discussions, and/or the writing of scientific papers.
- IVC. Identify and characterize the composing elements of dynamic and organic wholes, structures, and systems.
  This is accomplished by examining ecosystems and their component parts that contribute to a functional, interactive whole.

Student Expectations

Students will
1) complete all reading assignments on time,
2) participate in class discussions and Q & A sessions,
3) complete all assigned homework before specified deadlines,
4) follow all safety procedures and guidelines
5) maintain a respectful and collaborative classroom atmosphere

Important: Students should also regularly check their email and the EBE resources on Moodle for information from their EBE teacher. This information might include course updates, reminders, reading assignments, class handouts, supplements to class discussions, information about upcoming exams and quizzes, work for students to complete in the event of a teacher absence, etc.

Reading Assignments and Class Discussions

Students frequently will be given reading assignments to complete outside of class. These assignments will often be chapters from books, articles from scientific journals, articles from newspapers, or information from reputable web sites. It is imperative that students complete each reading assignment before the date on which it is scheduled to be discussed in class. Class discussions will typically follow one of three formats: small group discussions, large group discussions, or "Q & A" sessions.

Computer Policy

Students should bring their laptop computers to class each day. Students may use (and at times will be required to use) computers when working on class activities, web activities, and/or laboratory experiments. Computers also can be used for general note-taking purposes during lectures and class discussions. If, however, students are caught using their computers inappropriately (e.g., playing games, viewing Facebook pages, working on assignments for other courses, etc.), they may lose their computer use privileges and further disciplinary action might also be taken, including action that may affect scores or grades on assignments and assessments.

Assessments

Performance and learning in this course will be measured by assessing the quality of student work on 1) exams and quizzes, and 2) assigned homework and/or laboratory work. Scheduled quizzes are usually 5-15 points; exams and other projects are usually 20-40 points; and homework and/or laboratory assignments are usually between 5 and 25 points, depending on the amount of work required.

Note: Exams and quizzes will focus on gauging student learning with respect to both content standards and the IMSA Standards for Significant Learning (SSLs). Special emphasis will be given to designing questions and assessment tasks that measure student learning with respect to the levels of understanding described in Bloom's Taxonomy (i.e., knowledge, comprehension, application, analysis, synthesis, and evaluation).

Pop quizzes (worth only 2-5 points) *may* be given at any point during the semester to assess whether students are completing required reading assignments or keeping up with coursework.

Grading

Letter grades will be assigned as follows:

Letter Grade		Average*
A	=	90-100%
B	=	80-89.99%
C	=	70-79.99%
D	=	below 70%

* The teacher may modify these percentages at the end of the semester so as to better overlap the grade ranges with the distribution of assessment averages. Any modification made will not penalize students with respect to their final letter grade.

Late Work and Missed Assessments

Late Work: Assignments will be considered late if not submitted by the due date. Late work will be accepted with a 10% penalty for each school day (24 hour period) the work is late up to a maximum of 3 calendar days. If a student has an excused absence on the day an assignment is due, that assignment must be turned in on the day the student returns to class in order to avoid a late penalty. Late work due to an unexcused absence will be subject to the normal late penalty. [Note: If the teacher has returned an assignment to the students with grades and/or feedback, late work for that assignment will no longer be accepted.]

Missed Assessments: A student will be allowed to make-up a missed assessment (i.e., quiz or exam) with no penalty if the student's absence is excused. If the absence is unexcused or the student uses a "stress day" on the day a scheduled exam or quiz is given, a 20% penalty will be applied to the missed assessment.