



BIOL-146: BIODIVERSITY

Effective Term

Fall 2025

BOT Approval Date

11/09/2023

Discipline

BIOL - Biology

Course Number

146

Course Title

Biodiversity

Short Title

Biodiversity

Credit Status (CB 04)

D - Credit - Degree applicable

Units**Lecture Units**

3.00

Total Units

3.00

Hours**Lecture Contact Hours**

48-54

Out of Class Hours Lecture

96-108

Total Contact Hours

48 - 54

Total Out of Class Hours

96 - 108

Total Student Learning Hours

144 - 162

Distance Education

Yes

Distance Education**Distance Education Type**

Both Fully Online and Hybrid Online

Fully Online Delivery Requirements:

- a. Students must be notified via the college schedule of classes and the syllabus for the class if proctored tests are required for this course
- b. Any planned face-to-face meetings, such as an orientation or study session, must be optional

c. The MSJC curriculum committee requires the use of accessible, asynchronous discussion as a component of every fully online course

Are you using publisher content?

No

Regular Substantive Interaction

Instructor-to-student, student-to-student, and student-to-content contact shall be distributed in a manner that will ensure regular substantive interaction (RSI) is maintained not only weekly but also for the duration of the course. Instructor interactions should be equivalent in time, quality and consistency to the engagement students would receive in a face-to-face course—for example, through announcements, discussion participation, personalized feedback, video messages, or other instructional communications. Instructors are expected to be responsive to student inquiries within a 24-72 hour time frame excluding holidays. RSI will be maintained through a variety of methods:

- Orientation - Students must be oriented to the online and face-to-face portions at the start of the course.
- Announcements - Announcements using the course management system must be posted at least weekly to keep students current on course events, due dates, materials, etc.
- Discussion Forums - Content-related discussion forums within the designated CMS will include appropriate instructor participation and will be initiated and maintained, with timely feedback provided. Instructors are required to monitor the discussions and related activities to provide guidance and direction. Open-ended discussion boards may be used to further learning and interaction.
- MSJC Communication – Instructor will use MSJC-administered communication tools (such as email or the designated CMS communication tools) to regularly communicate with and provide ease of access to students.
- Timely Feedback - Timely feedback on student work will be provided by the instructor, which may include comments and/or rubrics, within the Grades area of the designated CMS.
- Scheduled Meetings – Hybrid and synchronous courses will meet at regularly scheduled times.

ADA Compliance - All course interactions and content must be designed with accessibility in mind and meet ADA requirements.

Catalog Description

This course examines the biodiversity of life. Theories about the evolution and diversity of life are introduced with an emphasis on current threats to biodiversity by human activity. This course is a survey of the biodiversity of life on earth through an exploration of the structure, function, evolution, reproduction, genetics, and ecology of organisms past and present. Field trips may be required. This course is not intended for biology majors.

Codes

TOP Code (CB 03)

0408.00 - Natural History

CIP Code

26.1310 - Ecology and Evolutionary Biology.

Repeatability Code

No

Grading Option

Letter grade OR P/NP

GE Information

Check GE Types Requested

AA/AS A - Natural and Physical Sciences

Cal-GETC Areas

Approved Cal-GETC Area

AREA-5B

Learning Objectives

Learning Objectives

Learning Objective

1. Describe and apply the scientific method, explain how it is related to the study of the biodiversity of life and contrast western scientific approaches with traditional ecological knowledge.

2. Evaluate the history of life on planet Earth.
3. Illustrate and identify the Domains of life, and diagram the Linnaean system of classification.
4. Formulate conclusions about the contributions of biodiversity conservation from different cultural and gender groups as well as the differential impacts of biodiversity loss.
5. Analyze the field of genetics, including Mendel's Laws.
6. Discuss the strengths and weakness of genes, gene pools, population sizes and passive contributions to evolutionary change.
7. Evaluate the mechanisms of micro- and macroevolution and their application to biodiversity.
8. Compare and contrast Darwin's theory of evolution by natural selection with other theories of evolution, including Gould's theory of the mechanisms of punctuated equilibrium.
9. Differentiate between background extinction and human-induced extinction.
10. Identify threats to biodiversity and explore the impacts of localized extinction on cultural identity.
11. Inspect the field of biotechnology and genetically modified organisms and their possible effects on natural systems.
12. Synthesize information about threatened and endangered species.

Learning Outcome Information

Course Learning Outcomes

Learning Outcome

1. The student will demonstrate the ability to apply the scientific method and to evaluate data with regards to biodiversity.
2. The student will organize their time and exhibit persistence in completing course work.
3. The student will critically examine the diversity of scientists and career pathways in biology and ecology, fostering an inclusive mindset towards various identities and experiences within the scientific community.

Program Learning Outcomes

Learning Outcome

- Achieve basic literacy in the language of biology.
- Explain and appreciate how scientific knowledge is obtained and verified.
- Explain and appreciate the cycling of matter and the flow of energy in living systems.
- Explore and appreciate the facts and principles concerning heredity, variation and diversity, the cell, evolution and natural selection.
- Explore the ethical and social considerations inherent in biology.
- Think critically about issues using their understanding of biology.

Institutional Learning Outcomes

- Aesthetic Awareness: The student will identify and evaluate how aesthetic expression leads to an appreciation of social and cultural context as well as the values of art and nature.
- Critical Thinking: The student will analyze problems, gather and synthesize relevant information, evaluate ideas, information, and evaluate alternative points of view to create, innovate and implement effective solutions.
- Scientific Awareness: The student will apply the scientific method of inquiry to assess potential solutions for real-life challenges by employing science-based knowledge and methodologies in daily life.

Content

Course Lecture Content

1. Science Fundamentals
 - a. The Scientific Method
 - b. Traditional Ecological Knowledge
 - c. Basic genetics and patterns of inheritance
 - d. Levels of Biodiversity
2. History of Life on Planet Earth
 - a. Geological Time Scale
 - b. The Five Historical Extinctions
3. Modern Biodiversity

- a. Tree of Life
- b. Linnaean Classification
- c. Taxonomy, Phylogenetics and Cladistics
- 4. Population Genetics
 - a. Gene Pools
 - b. Genetic Drift
 - c. Genetic Bottleneck
 - d. Founder Effect
- 5. Evolution
 - a. History of Darwin
 - b. Mutation
 - c. Natural Selection
 - d. Speciation
 - e. Punctuated Equilibrium
 - f. Macroevolution
- 6. Biodiversity Loss
 - a. The Sixth Mass Extinction
 - b. Drivers of Extinction
- 7. Cultural Values of Biodiversity
 - a. Variable impacts of Biodiversity Loss across cultures, genders and ethnic groups
 - b. Assigning Conservation Values
 - c. Social and Intuition Criteria
 - d. Societal Values
 - e. Approaches to Priority Setting
- 8. Laws and Regulations
 - a. Social Concerns
 - b. Debt for Nature Swaps
- 9. Genetically Modified Organisms
 - a. Gene splicing
 - b. Cloning
 - c. Conserving Diverse Human Cultures and Ethnobiological Knowledge

Methods of Instruction

Method

Discussion

Integration

Students will engage in group discussions to explore their unique perspectives in thinking critically about contemporary threats to biodiversity as well as conservation efforts. An example question to stimulate discussion could be: What are the pros and cons of bio-prospecting?

DE Adaptations for MOI

Discussions may be facilitated asynchronously using the discussion forum feature of the CMS or synchronously by leveraging the technology of accessible video conferencing software.

Method

Observation and Demonstration

Integration

Students will be invited to engage in hands-on exercises designed to emphasize principles taught in lectures. These activities will highlight observational, experimental, and problem-solving skills. For example, students may be given pictures and asked to evaluate the morphological structures of various representative members of a domain and then categorize them into kingdoms based on appearance alone.

DE Adaptations for MOI

Exercises and demonstrations will be presented virtually using a variety of approaches in the CMS. These may include videos, simulations, or data analysis activities. All materials will be checked for accessibility.

Method

Lecture

Integration

Students will engage with lecture material that will introduce core biodiversity concepts. Verbal lectures may be complemented with audio-visual materials such as, but not limited to videos and PowerPoint presentations. An example lecture might include a description of an endemic species with slides to show specialized adaptations, descriptions of characteristics and habitat, supplemental materials, and side topics discussed.

DE Adaptations for MOI

Lecture material will be accessible and presented in various forms using the CMS, including recorded video lectures, written narratives, slide decks, or synchronous presentations (facilitated using accessible video conferencing software).

Methods of Evaluation**Method**

Exams/Tests

Integration

Students will demonstrate mastery of important concepts related to biodiversity by completing examinations that will require critical analysis and synthesis of information learned from lectures, the textbook, and in-class assignments. An example question: "Evaluate one of the pre-cursors to the sixth mass extinction?" Exams may consist of a variety of question types, including but not limited to multiple-choice, short answer, or essay. Clear rubrics and prompt feedback will be provided.

DE Adaptations for MOE

Exams will be administered using the Quiz feature of the CMS. All infographics presented in the questions will be accessible. Instructor feedback will be delivered through the quiz feature of the CMS and grades will be presented in the grade book in a timely manner consistent with the progression of the course.

Method

Papers

Integration

Students will be challenged to synthesize information learned throughout the course in the preparation of written reports on current topics, controversial issues, and/or a biodiversity subject. For example, students may be asked to research a topic related to mass extinctions and present the information in a short, 2-3 page paper.

DE Adaptations for MOE

Students will draw on resources presented in the course via the CMS or accessed online through the MSJC library database. Papers will be submitted in the Assignment feature of the CMS. Clear rubrics will be provided along with the assignment and the instructor will give timely feedback.

Method

Quizzes

Integration

Students will be invited to explore their mastery of important concepts related to biodiversity by engaging with formative assessments. These will take the form of quizzes on terminology or concepts and will be completed in preparation for larger

examinations. An example question: "Define biodiversity." Quizzes will be based on a variety of question types, including, but not limited to multiple-choice, short answer, and essay.

DE Adaptations for MOE

Quizzing will be facilitated through the Quiz feature of the Cms and all questions will be based on accessible materials. Feedback will be provided in a timely manner and grades will be housed in the CMS.

Assignments

Assignment Type

Reading

In-class and/or outside of class

In-class

Formative or Summative

Formative

Assignment

The local region is considered to be a biodiversity hotspot. From a map of other such regions, choose a biodiversity hotspot in another part of the world. Research an article discussing conservation for each of the two regions using the MSJC Library's online databases. From the readings, list the anthropogenic threats that impact the species inhabiting each region and prepare a short 1-2 page discussion comparing the two hotspots. Consider the extent to which the threats are locally generated or originate from outside forces, and how the local people relate to their immediate environment.

How assignment will be adapted in online format

Students will be provided with a map of biodiversity hotspots in an accessible format in the CMS. MSJC Library databases will be accessed online. They will prepare their written response and submit them using the assignment feature of the CMS. Grading and feedback will be provided in a timely manner using the appropriate tools within the CMS.

Assignment Type

Writing

In-class and/or outside of class

Outside of class

Formative or Summative

Summative

Assignment

Choose a species listed on the IUCN Red List as critically endangered. Using the knowledge you have gained about evolution and phylogeny, write a one-page justification for a budget to increase the conservation funding for this specific species based on its unique intrinsic and extrinsic values as a component of global biodiversity.

How assignment will be adapted in online format

Students will be provided with a link to the IUCN Red Listed species. Their papers will be submitted through the Assignment feature of the CMS. Grades and constructive feedback will be provided to students in a timely manner by utilizing the appropriate features within the CMS.

Assignment Type

Writing

In-class and/or outside of class

In-class

Formative or Summative

Summative

Assignment

Based on the information related to ethnobiology, traditional ecological knowledge, and the interactions between people and their local biodiversity that have been explored in this course, please write a 500-750 word response to the following prompt: how does the loss or extinction of indigenous languages and cultural groups impact the world's biodiversity resources?

How assignment will be adapted in online format

Students will be provided with all foundational materials through readings and virtual lectures in the CMS. This writing assignment will be presented using the assignment feature of the CMS, which is also where students will submit their work. Timely and constructive feedback will be provided using the feedback feature in the assignment.

Course Materials

Textbooks

Allendorf, F.W., W.C. Funk, S. N. Aitken, M. Byrne, and G. Luikart. (2022). Conservation and Genomics of Populations. Oxford University Press.

Eric Chivian and Aaron Bernstein (2008). Sustaining Life: How Human Health Depends on Biodiversity Oxford University Press. ISBN: 0195175093

E.O Wilson (2002). Conserving Earth's Biodiversity Island Press. ISBN: 1-55963-773-0

Boenigk, J. Wodniok, S. Glücksman, E. (2015). Biodiversity and Earth History Springer. ISBN: 978-3662463932

Class Size Information

Class Size

40

Class Size Category

A - Lecture/discussion 40

Diversity and Inclusion

Explain how diversity and inclusion(e.g., gender, culture/race, sexuality, etc.) is infused into the course.

This course explores the diversification of life and entails the complex interrelationships between people and the organisms that surround them. Students will be invited to explore how different races, ethnicities and genders are defined and impacted by extant biodiversity, as well as how they are affected and compromised by biodiversity loss. These issues range from cultural identity to food security. Students are expected to integrate the material into an exploration of their own lived experiences and share their diverse perspectives in an environment governed by norms of inclusivity.

Describe how assignments, instruction, evaluation, course content, and interactions are contextualized for diverse learners promoting an equitable course.

Instruction is focused on eliminating structural barriers to success by incorporating open educational resources and presenting a diverse array of media to connect with a spectrum of learning styles. In addition, students are expected to interact with one another in discussions focused on contemporary issues and to share their perspectives and personal experiences while adhering to norms of inclusivity. Students are encouraged to challenge normative expectations of what it means to engage with science and are provided with the tools to be active in the scientific endeavor regardless of their chosen major or career path.

Interactions

Explain how the course will incorporate student-to-student interaction.

Students will have frequent opportunities to interact with one another in online or in-person discussions focusing on issues surrounding biodiversity. These interactions will augment the other forms of content delivery employed in this course by exposing students to diverse perspectives held by members of their own communities. Students will be encouraged to develop and abide by norms of tolerance and inclusivity.

Explain how the course will incorporate instructor-to-student interaction.

Instructors will participate in and guide group discussions. In the distance education modality, these interactions may be either asynchronous, taking place in the discussion forum or via email communication, or synchronous, via video conferencing. For challenging assignments and projects, instructors will model metacognitive approaches, engaging with students to guide them through complex critical thinking processes. This may include demonstrations of map reading techniques, data interpretation approaches, or interactions with complex primary literature sources. Feedback will be provided either verbally, in writing, or in the course management system. Instructors will be available to answer questions and interact with students directly.

Explain how the course will incorporate student-to-content interaction.

Students will be provided with a variety of accessible forms of media for content delivery. These may include written narratives, journal articles, textbook materials, videos, or verbal lectures. A diverse array of approaches will be employed to accommodate a spectrum of learning styles. For the online modality, these materials will be posted in an accessible format in the course management system, with the lecture component being recorded and captioned. Students will work towards concept mastery through formative assessments, engage in deeper more reflective work through critical writing assignments, and will assess their assimilation of the content through summative assignments. Students will engage with content in active ways, bringing their schema to bear with reading assignments, mining data for meaning, and providing feedback to enhance relevance and relatability.

Explain how the course will incorporate student-to-self interaction (metacognitive).

Students will engage in critical thinking activities that require them to explore the ways in which their understanding of evolution and biodiversity directly impacts their lives. They will be encouraged to critically assess their ethical stance on biodiversity loss and conservation issues that affect diverse stakeholders in varying ways. Students will have the opportunity to reflect on any discordance between their subjective worldview and their understanding of objective science. Students will consider their own relationship to biodiversity science and through a variety of analysis projects explore differences in the ways people around the world interact with their immediate environment. Through reflection, students will be immersed in the global context of the topics presented in the course.

Key: 481