



## **CIEE Global Institute – Monteverde**

<b>Course name:</b>	Plants and People
<b>Course number:</b>	(GI) ENVI 1002 MOCR
<b>Programs offering course:</b>	Monteverde Open Campus Block: STEM and Society
<b>Open Campus track:</b>	STEM and Society
<b>Language of instruction:</b>	English
<b>U.S. semester credits:</b>	3
<b>Contact hours:</b>	45
<b>Term:</b>	Fall 2019

### **Course Description**

This course introduces students to the relationship between humans and plants. They will explore how plants have shaped the earth's biosphere, human evolution and civilizations. Students also investigate how human activities alter plants from a genetic to an ecosystem level. This course gives students an understanding of the different dimensions at which plants and humans interact and influence each other. The scope of the course is global but will use specific examples of Costa Rica to illustrate important concepts.

### **Learning Objectives**

#### **Upon completion of the course students will:**

- Understand the fundamental role of plants as primary producers in Earth's biosphere.
- Describe the relationship between plants and humans has evolved since the beginning of our species' history
- Discuss the role plants have played in shaping human cultures around the world
- Chronicle how humans have shaped plants through artificial selection and genetic engineering
- Explain the economic importance of plants
- Know how modern human history has been shaped by plant biodiversity
- Articulate the role of plants in the carbon cycle
- Link how climate change affects plant diversity
- Interpret the effects globalization and the green revolution are having on plant diversity



### Course Prerequisites

None

### Methods of Instruction

Students will attend lectures and related activities. Lectures will be complemented by experiential learning and critical thinking. Students will read and analyze current literature as well as monitor technological trends in the internet. Students will spend time in the field collecting field data to complement theoretical aspects of the course. During the course students will develop projects about economic or culturally important plant families and present them to their fellow students.

### Assessment and Final Grade

Weekly Quizzes (5)	30 %
Plant Family Report Written	10 %
Plant Family Report Oral	10 %
Final Exam	30 %
Participation	20 %
Total	100 %

### Course Requirements

#### **Weekly Quizzes**

Each week, students will take a quiz on the previous week's course material, including lectures, labs, activities and readings. Quizzes may be in-class activities with True/False, Multiple Choice, calculations, filling in blanks and short answer questions, or they may be take home essay assignments. Quizzes will cover only new material, but similar questions to those on the quizzes will be seen again on the comprehensive final exam.

#### **Plant Family Report**

These will consist on a written 500-750 word report and 5-10 minute oral presentation about economically important plant families. These will be first revised by the instructor and later presented to other students.



### **Final Exam**

At the end of the course, students will take a final exam covering all previous material. As with quizzes, the final exam will have a variety of question formats, including True/False, Multiple Choice, filling in blanks, essay and short answer questions.

### **Participation**

Participation is valued as meaningful contribution in the digital and tangible classroom, utilizing the resources and materials presented to students as part of the course. Meaningful contribution requires students to be prepared in advance of each class session and to have regular attendance. Students must clearly demonstrate they have engaged with the materials as directed, for example, through classroom discussions, online discussion boards, peer-to-peer feedback (after presentations), interaction with guest speakers, and attentiveness on co-curricular and outside-of-classroom activities.

### **Class Attendance**

Regular class attendance is required throughout the program, and all unexcused absences will result in a lower participation grade for any affected CIEE course. Due to the intensive schedules for Open Campus programs, unexcused absences that constitute more than 10% of the total course will result in a written warning.

Students who transfer from one CIEE class to another during the add/drop period will not be considered absent from the first session(s) of their new class, provided they were marked present for the first session(s) of their original class. Otherwise, the absence(s) from the original class carry over to the new class and count against the grade in that class.

For CIEE classes, excessively tardy (over 15 minutes late) students must be marked absent. Attendance policies also apply to any required co-curricular class excursion or event, as well as to Internship, Service Learning, or required field placement. Students who miss class for personal travel, including unforeseen delays that arise as a result of personal travel, will be marked as absent and unexcused. No make-up or re-sit opportunity will be provided.

Attendance policies also apply to any required class excursion, with the exception that some class excursions cannot accommodate any tardiness, and students risk being marked as absent if they fail to be present at the appointed time.

Unexcused absences will lead to the following penalties:



<i>Percentage of Total Course Hours Missed</i>	<i>Equivalent Number of Open Campus Semester classes</i>	<i>Minimum Penalty</i>
Up to 10%	1 content classes, or up to 2 language classes	Participation graded as per class requirements
10 – 20%	2 content classes, or 3-4 language classes	Participation graded as per class requirements; <b>written warning</b>
More than 20%	3 content classes, or 5 language classes	Automatic <b>course failure</b> , and possible expulsion

### **Weekly Schedule**

NOTE: this schedule is subject to change at the discretion of the instructor to take advantage of current experiential learning opportunities.

#### **Week 1 Botanical Fundamentals**

Session 1.1: Plants: basic biology, ecology and their role as primary producers. During this lecture students will learn the basics of photosynthesis, basic plant taxonomy, flowering plant ecology, and the role plants play in the biosphere as primary producers.

Readings:

- Mauseth J.D. 2013. Chapters 1 and 5

#### **Week 2 Plants and the Ecosystem**

Quiz 1

Session 2.1. Plants and the carbon cycle. For this lecture students will learn how photosynthetic organisms changed planetary climate when they first evolved. We will study the role plants have in storing carbon and how human-driven deforestation alters these carbon storages.

Readings:



- Mauseth J.D. 2013. Chapter 11

Session 2.2: Global distribution of plants. During this session we will discuss global distribution and diversity of plants. The relationship of this diversity to cultural diversity and the theories behind the factors that make plant diversity in the tropics so high.

Readings:

- Mauseth J.D. 2013. Chapter 10
- Stepp et al. (2005) Mountains and Biocultural Diversity Mountain Research and Development 25(3):223-227 · August 2005 with 16 Reads DOI: 10.2307/3674651.

### **Week 3 Plants and Human Culture**

#### Quiz 2

Session 3.1: Plants and Human Culture. A review of historical and pre-historical records of plant uses among different cultures will be review. Emphasis will be put on the rise of major civilizations and the crops they used as well as the drive for exploration and colonization that was driven by economically important plant species.

Readings:

- Diamond, J. 1997. Guns, Germs and Steel. W.W Norton & Company, Chapters 6 and 7

Session 3.2: Wild edible plants. This lecture will introduce students to wild edible plants in the beginning of human plant use history. It will focus on the importance of the potential of wild edible plants for future crop discovery.

Readings:

- Castaneda H., & Stepp, J.R. (2007) Ethnoecological Importance Value (EIV) Methodology: Assessing the Cultural Importance of Ecosystems as Sources of Useful Plants for the Guaymi People of Costa Rica. Ethnobotany Research and Applications. Vol 5 (2007).



Session 3.3: Plant domestication. Historical records, and global domestication centers. We will touch on topics such as artificial selection and genetic engineering. We will also have an overview of undomesticated plants with edible or industrial potential.

#### **Week 4. Agriculture**

##### Quiz 3

Session 4.1 Early farming techniques and their impact on early civilizations. We will look at early farming techniques developed independently in Indonesia, Mesoamerica, South Asia, Middle east and South America.

##### Readings:

- Sheets et al. (2012) Ancient Manioc Agriculture South of the Ceren Village, El Salvador. *Latin American Antiquity*. Volume 23, Issue 3 September 2012 , pp. 259-281.
- Lansing J.S. (1987) Balinese “Water Temples” and the Management of Irrigation. *American Anthropologist*. Volume 89, Issue 2.
- Mazoyer M. & Roudart, L. (2006) *A History of World Agriculture. From the Neolithic Age to the Current Crisis*. Routledge. (Chapters 5, 7)

Session 4.2: The Green Revolution. This lecture and activities will delve into the implications of the Green revolution for the world economic and political system. Students will learn how this technological and political revolution has affected local biodiversity as well as other impacts in social and environmental systems around the world.

##### Readings:

- *Clapp, J. (2010). Food. Cambridge: Polity Press (Chapter 2).*

Session 4.3 Medicinal plants. This class will look into the historical use of plants as medicine. An introduction to pre-industrial medicinal uses, pharmaceutical bioprospecting from nature and gene prospecting in present times. We will look into the case study of InBio in Costa Rica as an example of government directed bioprospecting and the reasons for its failure. Students will be introduced to the biochemical origin of alkaloids and why some have medicinal properties on humans.

##### Readings:



- Mauseth J.D. 2013 Chapter 15

## **Week 5: Plant Uses Beyond Agriculture**

### Quiz 4

Session 5.1: Herbs and spices. This class will introduce students to the biochemistry and biology of volatile oils and other aromatic compounds. They will learn about plant chemical communication and how these chemicals are used by humans. Subsequently we will look into the spice trade and the role it played in precolonial and colonial times.

#### Readings:

- Mauseth J.D. 2013. Chapter 14

Session 5.2: Industrial uses of plants. We will look into past and present uses of plants for building materials, fibers, dyes, and tannins. We will look at examples of these uses and the implications of these uses for plant populations and diversity. Students also look at plants as natural energy storages. From fire-wood use in poor regions, fossil fuels as stored plant biomass to modern biodiesel and ethanol. We will discuss the potential and impacts of using plants as a means of storing solar energy for fuel use.

#### Readings:

- Mauseth J.D. 2013. Chapter 16
- Tilman, D. et al. (2009) Beneficial Biofuels: The Food, Energy and Environmental Trilemma. *Science* Vol 235, pp 270-271.

### Session 5.3: Student Plant Presentations

## **Week 6 New Frontiers in Plant-Human Interactions**

### Quiz 5



Session 6.1: Landscape identity and plants. During this class we will have a guest lecturer on landscape design using native plants. We will look at the psychological and cultural aspects of using native plants to create a place-identity. We will use native plant gardens in Monteverde as an example.

Session 6.2: Pharmaceutical plants. Throughout history humans have used plant chemical properties for medicines. Students will learn the main types of pharmaceutical chemicals found in plants. They will also learn about traditional spiritual uses of hallucinogenic plants and uses of mind-altering substances in contemporary society. We will discuss the cultural relativity of the ethics of bioprospecting and using these medicinal and psychoactive substances.

Readings:

- Mauseth J.D. (2013) Plants and People (Jones & Bartlett Learning Topics in Biology Series) 1st Edition. James & Bartlett learning (Chapter 17)

Session 6.3: Plants and climate change. How is climate change affecting plant diversity and distribution. During this lecture students will learn about positive feedbacks between climate change and forests elimination. We will discuss changing distributions of life zones across latitudes and altitudes. Additionally we will discuss the implications of these changes for human food security and economic stability? We will use Monteverde as an example of these changes.

Readings:

- Parry, M.L. et al. (2004) Effects of climate change on global food production under SRES emissions and socio-economic scenarios. Global Environmental Change. Volume 14, Issue 1, April 2004, Pages 53-67.
- Thuiller, W. (2005) Climate change threats to plant diversity in Europe. Proceedings of the National Academy of Sciences Jun 2005, 102 (23) 8245-8250; DOI:10.1073/pnas.0409902102

Final Exam

### Course Materials



## Course Textbook

James D. Mauseth (2013) *Plants and People* (Jones & Bartlett Learning Topics in Biology Series) 1st Edition. James & Bartlett learning

## Readings

- Castaneda H., & Stepp, J.R. (2007) Ethnoecological Importance Value (EIV) Methodology: Assessing the Cultural Importance of Ecosystems as Sources of Useful Plants for the Guaymi People of Costa Rica. *Ethnobotany Research and Applications*. Vol 5.
- Clapp, J. (2010). *Food*. Cambridge: Polity Press (Chapter 2).
- Diamond, J. (1997) *Guns, Germs and Steel*. W.W Norton & Company (Chapters 6 and 7).
- Lansing J.S. (1987) Balinese “Water Temples” and the Management of Irrigation. *American Anthropologist*. Volume 89, Issue 2.
- Mauseth J.D. (2013) *Plants and People* (Jones & Bartlett Learning Topics in Biology Series) 1st Edition. James & Bartlett learning.
- Mazoyer M. & Roudart, L. (2006) *A History of World Agriculture. From the Neolithic Age to the Current Crisis*. Routledge. (Chapters 5, 7)
  
- Parry, M.L. et al. (2004) Effects of climate change on global food production under SRES emissions and socio-economic scenarios. *Global Environmental Change*. Volume 14, Issue 1, April 2004, Pages 53-67.
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- Tilman, D. et al. (2009) Beneficial Biofuels: The Food, Energy and Environmental Trilemma. *Science* Vol 235, pp 270-271.