CIEE Global Institute - Monteverde

Course name: Global Change and the Environment
Course number: (GI) ENVI 2005 MOCR
Programs offering course: Monteverde Open Campus Block: STEM and Society
Open Campus track: STEM and Society
Language of instruction: English
U.S. semester credits: 3
Contact hours: 45 lecture
Term: Spring 2020

Course Description

This interdisciplinary course treats the rapid and large-scale change that characterizes what some scholars now refer to as the 'Anthropocene'. Students will learn about how potent, anthropogenic drivers and fast-paced technological changes impact developing countries. Topics include globalization, climate change, population transitions and trends, urbanization, water and energy issues, dietary transitions, and disruptive technologies, complex adaptive systems and scenario planning.

Learning Objectives

Upon completion of the course students will:

- Investigate and define the global changes our planet is undergoing due to human activities
- Describe the trends of human population growth, distribution, and social-economic conditions of these populations are evolving with its implications for the environment.
- Use scientific data that documents climate change, its causes and consequences to humans and the environment and use it to explain what can be done to mitigate and adapt to these changes.
- Articulate what disruptive and exponential technologies are and how they will affect humans and their environment.
- Develop skills relating to managing complex systems and using scenario planning for adapting to global change.

Course Prerequisites

None

Methods of Instruction

Students will attend lectures and related field and workshop 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 be engaged in student-led seminars to discuss trends and technologies related to global change.

Assessment and Final Grade

Participation	20 %
Weekly Quizzes (five)	25 %
Global Change and Culture Essay	10 %
Student led seminar on Global Change	20 %
Final Exam	25 %

Course Requirements

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.

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.

Global Change and Culture Essay
Students will write a 500-word essay addressing both how global environmental change impacts culture and how culture impacts rates of habitat loss, biodiversity protection, hunting pressure, exploitation of natural resources and other drivers of global change.

Student-led seminar

At the beginning of the course, each student will be assigned a relevant issue in Global Change. They will be tasked with finding appropriate reading material, distributing it to their classmates with previous approval of the instructor and conducting a one our discussion seminar for the rest of the class. Students will be graded as follows

Seminar Assessment (total of 20% for final evaluation)

Relevance of literature presented	5%
Ability to engage the class in the topic	5%
Relevance and depth of discussion	5%
Participation in classmate's seminars	5%

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, calculations, filling in blanks, essay and short answer questions.

<u>Class Attendance</u>

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:

Percentage of Total Course Hours Missed	Equivalent Number of Open Campus Semester classes	Minimum Penalty

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; **written warning**
More than 20%	3 content classes, or 5 language classes	Automatic **course failure**, 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   The Anthropocene
Session 1.1: The Anthropocene: what is the Anthropocene? Is it a valid term? What are the characteristics of this great acceleration of change and what are its underlying causes? Students and instructor will discuss the thical implications of accepting the Anthropocene. What are do the critics and supporters of the Anthropocene have to say. What are the ethical implications of accepting this proposed geological age?

Readings:

- McIntyre, V. (2005) A Modest Proposal. Nature. Vol 434.3 March 2005.
- Castree, N. (2016) An official welcome to the Anthropocene epock – but who gets to decide it's there? Us Department of Energy/Wikimedia commons.
- Weyler, R. 2016. The Anthropocene Debate. Blogpost
- Vansintjan, A. (2015) The Anthropocene Debate: Why is such a useful concept starting to fall appart? Uneven Earth. June 26, 2015.

Week 2   Human Population and Consumption

Quiz 1

Session 2.1: Human Population Changes in the Anthropocene. Students will learn how human populations tend to behave in terms of their growth rate. They will understand the concept of demographic transitions and how they affect the projections of human populations in the future. Students will also learn about what factors are shaping the behavior and distribution of populations and the great challenges we will face in the future as the trend towards urbanization occurs. Students will investigate the different challenges in population trends for tropical and temperate regions. Students will learn to interpret population pyramids and to compare trends from tropical and temperate countries. They will learn this by using online tools and data that are currently available from sources such as the UN. At the end of the session the difference of the challenges faced by tropical and temperate nations will be discussed.

Readings: Population Reference Bureau staff (2004). Transitions in World Population
                          (page 1- 22)

Session 2.2: Climate Change and its Causes: one of the most relevant changes happening in the world is the variation of climate patterns. Students will learn the difference between climate and weather. They will be exposed to the basics of the carbon cycle and the effect of GHG on climate. Students will be exposed to the source of the data that has been used to document climate change. Students will use local climatic variables (temperature, rainfall, number of storms) from online weather station data and compare their point measurements to long term trends. The activity underscores the difference between weather and climate. From these data students will draw their own conclusions of climate change in their region.

Readings:

- o   Hannah, L. (2014). Climate Change Biology. Chapter II: The Climate System and Climate change. Academic Press; 2nd edition (December 4, 2014) PP 13-50.

Week 3   Climate Change

Quiz 2

Session 3.1: Effects of Climate Change**.** Students will study the predicted effects climate change is expected to have, the mechanisms behind these changes and the implications for human populations and the environment. The topics will include changing weather patterns and their implications for human and non-human life, Sea level rise, human migration and conflict, changing distributions of tropical diseases. Students will engage in talks with local experts about concrete changes in ecosystems in the region and their implications on culture and society.

Readings:

- o   Hannah, L. (2014). Climate Change Biology. Chapter III-IV. Academic Press; 2nd edition (December 4, 2014) PP 57-122.

Session 3.2: Mitigation and Adaptation. Students will be introduced to concrete solutions available through the applied science that can help mitigate the causes of climate change and help human populations adapt to inevitable changes. This class will focus on the areas of agriculture, transportation and electric generation. Students will investigate sites nearby where both mitigation and adaptation measures are being applied. They will learn local initiatives on electric mobility and carbon neutrality implemented in the region.

Readings

- o Verocht, L.V., et al (2007) Climate change: linking mitigation and adaptation through agroforestry. Mitigation and Adaptation Strategies for Global Change. Vol. 12, No. 5. pp 901-918.
- o Locatelli, B. et al (2011) Forest and Climate Change in Latin America: linking adaptation and mitigation. Forests 2011, 2(1). 431-450.
- o Revi, A. (2008) Climate Change Risks: Adaptation and mitigation agendas for Indian cities. Environment and Urbanization. April 1, 2008.

Due: Global Environmental Change and Culture essay

Session 3.3: IPCC and Global Initiatives to Mitigate Climate Change. Students will learn the institutional structures provided by the United Nations and the financial and political strategies provided by them for tackling climate change through diplomacy. They will learn through case studies how these international policies manifest themselves at regional or country-level actions. They will also explore the role of culture in readiness to accept and implement these recommendations and follow internationally-dictated guidelines.

Readings:

- o Bouroncle, C. (2015) From Rio to Paris a summary of the climate change summit. Www.france24.com.

Week 4   Disruptive technologies

Quiz 3

Session 4.1: Disruptive Technologies. Students will be introduced to the concepts of disruptive and exponential technologies and what their effects on the world, particularly Developing countries, may be. Students will read and discuss the case study of the sharing economy (Air B&B, Uber and others) and its impact on housing and transportation worldwide. They will then investigate their own examples of disruptive technologies and share them with one another. Students will interview key informants regarding their perspectives on how disruptive technologies change the local economy and lead to environmental and social change.

Readings:
- o Singularity University. An Exponential Primer (2017) Singularity University. https://su.org/concepts/
- o Manyika, J. et al (2017) Disruptive technologies: Advances that will transform life, business, and the global economy. McKinsey Global Insitute. https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/disruptive-technologies
- o Prevett, R. (2018) 18 Disruptive Technology Trends For 2018. Disruption hub. https://disruptionhub.com/2018-disruptive-trends/

Session 4.2: The Energy Sector. During this session students will be exposed to the controversy regarding renewable, decentralized production versus the established centralized energy distribution model. What are the changes that need to happen in order for renewables to become the dominant for of energy production? The concepts of smart grids, decentralization and home production will be discussed. Students will discuss environmental paradoxes in renewable energy under the existing model of production.

Session 4.3: Food Production. Students will be exposed to the predominant paradigm of industrialized agriculture. Its effect on food security of developing nations and its weaknesses regarding its sustainability, and its effect on global climate and biodiversity. Students will be posed with the question of what disruptive technologies exist in the world today that could change the way the food industry works. Students will discuss their findings regarding possible disruptive technologies for the food industry and what their effects could be on local economies, global food trade and the environment. Topics of dematerialization, democratization and decentralization will be addressed.

Week 5 Adapting to New Technology

Quiz 4

Session 5.1: Transportation. Students will learn of what the current paradigm in transportation is and what technologies are threatening to change this paradigm. Students will be assigned three topics for discussion. Legislation that favors electric vehicles, urbanization vs. rural ecological footprints, and the use of telecommuting and virtual technologies for work and education. Students will discuss these topics and their economic, social and environmental implications for developing countries.

    Readings:
    o   Barkenbus, J. 2009. Our electric automotive future: CO2 savings through a disruptive technology. Policy and Society 27: 399-410.

Session 5.2: Job Displacement by Technology. During this topic students will learn the trends in labor-disrupting technologies. Mechanization, artificial intelligence and mass learning platforms will be included in this lecture. They will discuss the social, cultural and economic implications of the human workforce and its replacement by robots.

    Readings:
    o   Aoun, J.E. 2017. Robot-Proof: Higher Education in the Age of Artificial Intelligence. The MIT Press.

Session 5.3: Adapting to Exponential Technologies. What skills do students need to focus on to adapt to disruptive technologies taking into account the rate at which they are changing. The lecture will address skills like Managing big data, developing social skills, understanding exponential technological change, critical thinking, systems thinking, entrepreneurship and cultural agility.

Week 6   **Planning for Global Change**

Quiz 5

Session 6.1: Complex Adaptive Systems. Students will be introduced to the concepts of complex adaptive systems and how to think holistically about large-scale systems. Concepts of system resilience, thresholds, panarchies and adaptive systems and key variables will be introduced. Students will conduct a group exercise using different case studies to conceptualize a complex adaptive system. During the study they will develop skills of identifying system boundaries, identifying upper and lower panarchies, identifying the stage of system with regards to the adaptive cycle, identify key variables.

 Readings:
- o *Complex Adaptive Systems*
  https://www.youtube.com/watch?v=jBgq9eS6t_I&list=PLsJWgOB5mIMCiKZu61rKFT_-TncWzylN8&index=3

Session 6.2: Resilience Thinking. Students will study the concept of resilience, what are the characteristics of resilient systems, how can they be maintained and how this knowledge can be used to preserve desirable systems or disrupt undesirable systems. Students will conduct a case study based on real data of a social-ecological system in the local region. Particularly they will learn to select key variables that could play a role in tipping the system into alternate states.

 Readings:
- o Walker, B. & Salt, D. (2006). Resilience thinking: Sustaining ecosystems and people in a changing world. (Chapters 1, Ch 2, and Ch 6 pp. 145-148).

Session 6.3: Future Scenario Planning. Students will be introduced to scenario planning for the future as a tool to adapt to global change. Skills to be addressed will be key variable identification, identification of possible thresholds, selecting mitigation and adaptation actions, enhancing system resilience. Students will work in groups to create alternate scenarios for a real-life case study. They will be required to apply the knowledge they have acquired during the course.

 Readings:
- o Borjeson, L. et al. (2005) Scenario types and techniques: towards a user's guide. Futures. Vol 38, No 7.
- o Lingren, M. & Banhold, H. (2003) Scenario Planning: the link between the future and strategy. Palgrave Macmillan.

Final Exam

Readings

- Aoun, J.E. 2017. Robot-Proof: Higher Education in the Age of Artificial Intelligence. The MIT Press.
- Barkenbus, J. 2009. Our electric automotive future: CO2 savings through a disruptive technology. Policy and Society 27: 399-410
- Borjeson, L. et al. 2005. Scenario types and techniques: towards a user's guide. Futures. Vol 38, No 7.
- Bouroncle, C. 2015. From Rio to Paris a summary of the climate change summit. Www.france24.com.
- Hannah, L. 2014. Climate Change Biology. Chapter III-IV. Academic Press; 2nd edition, pp. 57-122.
- Lingren, M. & Banhold, H. 2003. Scenario Planning: the link between the future and strategy. Palgrave Macmillan.
- Locatelli, B. et al 2011. Forest and Climate Change in Latin America: linking adaptation and mitigation. Forests 2011, 2(1). 431-450.
- Manyika, J. et al (2017) Disruptive technologies: Advances that will transform life, business and the global economy. McKinsey Global Insitute. https://www.mckinsey.com/business functions/digital-mckinsey/our-insights/disruptive-technologies
- Population Reference Bureau staff 2004. Transitions in World Population pp. 1- 22
- Prevett, R. 2018. 18 Disruptive Technology Trends For 2018. Disruption hub. https://disruptionhub.com/2018-disruptive-trends/
- Revi, A. 2008. Climate Change Risks: Adaptation and mitigation agendas for Indian cities Environment and Urbanization.
- Singularity University. An Exponential Primer 2017. Singularity University. https://su.org/concepts/
- Verocht, L.V., et al. 2007. Climate change: linking mitigation and adaptation through agroforestry. Mitigation and Adaptation Strategies for Global Change. Vol. 12, No. 5. pp 901-918.
- Walker, B. & Salt, D. 2006. Resilience thinking: Sustaining ecosystems and people in a changing world. (Chapters 1, Ch 2, and Ch 6 (Pages 145-148). Complex Adaptive Systems https://www.youtube.com/watch?v=jBgq9eS6t_I&list=PLsJWgOB5mIMCiKZu61rKFT_-TncWzylN8&index=3