



## **CIEE in Mérida, Mexico**

<b>Course name:</b>	Mayan History, Culture and the Environment
<b>Course number:</b>	ENVI 2101 MEME
<b>Programs offering course:</b>	Science and Society - Merida
<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**

The Yucatan is home to the ancient and modern Mayan culture. Students will explore Mayan culture and ecology and how Mayans adapted to their tropical and subtropical forest environments. Further, they will link ancient Mayan culture and agricultural practices to a still little-understood past involving environmental change and ultimately, cultural and demographic collapse. Specifically, students will examine: How Mayan pioneering, establishment and natural resource use impacts the present environment, wildlands protection and biodiversity conservation. What past and current role does biodiversity play in traditional Mayan agriculture and subsistence? How sustainable is present-day Maya farming? What are the impacts of colonialism, tourism and other patterns of cultural and economic exchange? The intellectual disciplines that students will draw on to examine these questions include ecology, anthropology, archaeology, ethnobotany, and environmental studies.

### **Learning Objectives**

Upon completion of this course, students will:

- View history and culture through an environmental and scientific lens, critically examining how history, culture, technology and the environment are inexorably linked
- Explore how the environment is defined by abiotic factors and geological history
- Analyze the environmental conditions that allowed the Mayan civilization to grow in the Yucatán and spread throughout Mesoamerica
- Evaluate Mayan science and technological innovations that allowed Mayans to manipulate and exploit their natural habitat
- Consider how Mayan culture was shaped by the environment and whether it led to stewardship or over-exploitation
- Interpret the theory that the Mayan civilization collapsed from climate change and poor use of natural resources



- Relate historical lessons to contemporary Mayan culture and its relationship with the environment

### **Course Prerequisites**

None

### **Methods of Instruction**

This course is taught through the use of lectures (CIEE instructors and guest speakers), discussions, activities, interviews, readings, and an internet based research project. There are co-curricular visits to local research centers and field sites. CIEE-led lectures, readings, workshops and guided internet and computer research with discussions supply foundational information, concepts, and terminology, and help students make necessary connections. Guest lectures and interviews with environmental researchers and professionals offer unusual opportunities to learn about “on-the-ground” links between Mayan history, culture and environment.

### **Assessment and Final Grade**

Attendance and class participation	20%
Workshops	20%
Weekly Quizzes	20%
Problem Sets	10%
Essays on Speakers/Site Visits	15%
Final exam	20%

### **Course Requirements**

#### **Attendance and class participation (20%)**

Attendance is noted for each lecture, discussion session, and activity. As the 6-week session proceeds, students earn points for thoughtful commentary, questions, and participation in discussions and for attendance.

#### **Workshops (20%)**

Students will undertake a series of internet-based projects linking Mayan history, culture and the environment in novel and innovative ways. Evaluation will be based on (1) quality of data collection and analysis; (2) individual written reports of 1500 words (3) oral presentations (Powerpoint) for an audience of environmental science or environmental studies peers.

**Weekly Quizzes (15%)** At the end of each week, students will complete a quiz covering content from that week. There will be three quizzes in total. Quizzes will include True/False, multiple choice, fill in the blank, short and long answer formats.

#### **Problem Sets (10%)**



Each week, students will complete a set of questions or address problems associated each topic. These may be related to history, culture or the environment and how they interact.

### **Essays on Speakers/Site Visits (30%)**

Students will write critical essays addressing topics from invited speakers and site visits. These essays will summarize major elements of the talk or visit, fully explain the environmental history or culture behind it, and extend learning outcomes by further researching associated earth science, environmental challenges and suggested solutions.

### **Final Exam (20%)**

Students take a comprehensive exam on basic chemical concepts, environmental chemistry of major biogeochemical processes, how these are changing and what it means to society, as well as possible solutions covered in the course.

### **Attendance Policy**

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 Short Term 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.



## Weekly Schedule

### Week 1

- Topic 1: Introductory Concepts – Environment and its impact on Culture and History. Students will approach environmental history from several perspectives. First, how does the environment set the stage for culture and civilizations to develop? How have human activities historically depended on and responded to a dynamic natural world? Second, do attitudes toward the natural world change over time, and how have those attitudes shaped cultural, social, and political foundations? Third, how have human ideas, activities, and technologies affected the landscape, and what have been the consequences of those changes?
- Workshop - Research a link between environment, culture and history from different places in the world (excluding the Maya in Mesoamerica)
- Student Presentations: Environment, Culture and History Case Studies
- Watch: Sam Harris 2010. Science Can Answer Moral Questions TEDx Talk <https://www.youtube.com/watch?v=Hj9oB4zpHww>
- Discussion (graded participation): How environment shapes culture and history
- Readings
  - Boivin, N.L., Zeder, M.A., Fuller, D.Q., Crowther, A., Larson, G., Erlandson, J.M., Denham, T. and Petraglia, M.D., 2016. Ecological consequences of human niche construction: Examining long-term anthropogenic shaping of global species distributions. *Proceedings of the National Academy of Sciences*, 113(23), pp.6388-6396
  - McNeill, J.R., 2003. Observations on the nature and culture of environmental history. *History and theory*, 42(4), pp.5-43
- Assigned exercises and problems
- Workshop Written Report

### Week 2

- Topic 2: Climate and Geography of the Yucatán and Mesoamerica: Setting the Stage for the Mayan Empire. Students will use patterns of global climate to map major biomes. They will examine the unique geological history and geography of the Yucatán Peninsula, Mesoamerica, and how it explains the diversity of ecological life zones found there. They will study the Chicxulub Crater and explain its current impact on water availability. Students will examine current and historic weather data from Mérida to pinpoint periodicity of major climate forces, like wet and dry seasons, frequency of hurricanes and droughts.
- Workshop - Geological climate data and current weather patterns
- Discussion (graded participation): How environment sets the stage for culture and civilization
- Site Visit
  - Local Geology, Karst Topography, Evidence of Asteroid Impact, Cenote
- Readings



- Dunning, N.P., Luzzadder-Beach, S., Beach, T., Jones, J.G., Scarborough, V. and Culbert, T.P. (2002) Arising from the Bajos: the evolution of a Neotropical landscape and the rise of Maya civilization. *Annals of the Association of American Geographers* 92, 267–283
- Islebe, G.A., Torrescano-Valle, N., Aragón-Moreno, A.A., Vela-Peláez, A.A. and Valdez-Hernández, M., 2018. The Paleoanthropocene of the Yucatán Peninsula: palynological evidence of environmental change. *Boletín de la Sociedad Geológica Mexicana*, 70(1)
- Perry, E., Marin, L., McClain, J. and Velazquez, G., 1995. Ring of cenotes (sinkholes), northwest Yucatan, Mexico: its hydrogeologic characteristics and possible association with the Chicxulub impact crater. *Geology*, 23(1), pp.17-20
- Torrescano-Valle, N. and Folan, W.J., 2015. Physical settings, environmental history with an outlook on global change. In *Biodiversity and Conservation of the Yucatán Peninsula* (pp. 9-37). Springer
- Report on Site Visit
- Weekly Quiz 1
- Workshop Written Report

### Week 3

- Topic 3: Ancient Maya and their relationship to their environment. Students investigate how the Maya went from hunter-gathers to a major empire, while interacting with their natural environment. They will consider where agriculture took place, how farms, towns and cities formed, where trade routes developed and how this impacted the environment. They will see the challenges of little rain in many parts of the Mayan Empire and how Mayans coped. They will compare different farming methods, including slash and burn, terrace and raised field farming and how local climate and geography dictated which was used. They see how farming led to considerable loss of soil and soil fertility, and how irrigation led to salinization. Students will explore plants available to Mayans and how this led to their diet and food preparation practices. They will explore how lack of livestock species meant considerable bush meat hunting and how that impacted local wildlife.
- Workshop – How Ancient Mayans Interacted with their Environment. Students will research and report to one another on how ancient Mayans used and cared for their environment.
- Discussion (graded participation) – Did the ancient Maya interact with their environment sustainably?
- Readings
  - Ashmore, W., 2015. What Were Ancient Maya Landscapes Really Like?. *Journal of Anthropological Research*, 71(3), pp.305-326
  - Beach, T., Luzzadder-Beach, S., Cook, D., Dunning, N., Kennett, D.J., Krause, S., Terry, R., Trein, D. and Valdez, F., 2015. Ancient Maya impacts on the Earth's surface: An Early Anthropocene analog? *Quaternary Science Reviews*, 124, pp.1-30



- Cook, D.E., Beach, T. and Demarest, A.A., 2017. Soil and slaughter: a geoarchaeological record of the ancient Maya from Cancuén, Guatemala. *Journal of Archaeological Science: Reports*, 15, pp.330-343
- Luzzadder-Beach, S., Beach, T., Hutson, S. and Krause, S., 2016. Sky-earth, lake-sea: climate and water in Maya history and landscape. *Antiquity*, 90(350), pp.426-442
- Turner, B.L. II, Klepeis, P. and Schneider, L.C. (2003) Three millennia in the southern Yucatán peninsular region: implications for occupancy, use and carrying capacity. In: Gómez-Pompa, A., Allen, M., Fedick, S.L. and Jiménez-Osornio, J. (eds) *The Lowland Maya Area: Three Millennia at the Human–Wildland Interface*. Halworth Press, New York, pp. 361–387
- Assigned exercises and problems
- Weekly Quiz 2
- Essay on Site Visit
- Workshop Written Report

#### Week 4

- Topic 4: Ancient Mayan Science and Technology. Students examine different science and technology of the Maya and how they changed Mayan culture. Students will look at medical science, as shaman, use of medicinal plants and bloodletting practices. They will examine the science behind ancient Mayan agricultural practices, like use of ground water, irrigation and selective breeding of cultivars. Students explore ancient Mayan astronomy and how it impacted agriculture, holidays, concepts of time, cosmology, religion and archeology. They will investigate Mayan chemistry and its application to daily life, including uses in art. Students will learn Mayan math, how to use and its use in the Mayan calendar, naming of children and cultural rituals. Students link technological advances and cultural advances within the ancient Maya, as well. Finally, students will explore what elements of ancient Mayan culture directed, enhanced and limited science and technological innovation.
- Workshop: Using online resources, students research what ancient Mayans knew about different aspects of science and technology, including Mathematics, Astronomy, Architecture, Agriculture and others. Students will prepare a Powerpoint presentation on their findings and share them with the rest of the class.
- Guest Speaker: Current Mayan contributions to science and technology
- Discussion (graded participation): How did ancient Mayan science and technology inform their culture and interactions with their environment?
- Site Visit: Mayan Ruin Dzibilchatlun: How Architecture Reflects Science and Culture
- Extra Homework: Watch The Maya: Engineering an Empire  
<https://www.youtube.com/watch?v=s151jVxpx2E>
- Readings
  - Anderson, E.N., 2016. Traditional and Nontraditional Medicine in a Yucatec Maya Community. In *Plants and Health* (pp. 1-16). Springer, Cham.



- Chase, D.Z. and Chase, A.F., 2017. Caracol, Belize, and Changing Perceptions of Ancient Maya Society. *Journal of Archaeological Research*, 25(3), pp.185-249
- Dussol, L., Elliott, M., Michelet, D. and Nondédéo, P., 2017. Ancient Maya sylviculture of breadnut (*Brosimum alicastrum* Sw.) and sapodilla (*Manilkara zapota* (L.) P. Royen) at Naachtun (Guatemala): A reconstruction based on charcoal analysis. *Quaternary International*, 457, pp.29-42
- Lubman, D., 2015. On the acoustics of Maya pyramids. *The Journal of the Acoustical Society of America*, 137(4), pp.2427-2427
- Milbrath, S., 2017. Maya Astronomical Observations and the Agricultural Cycle in the Postclassic Madrid Codex. *Ancient Mesoamerica*, 28(2), pp.489-505
- Assigned exercises and problems
- Weekly Quiz 3
- Essay on Guest Speaker's presentation
- Workshop Written Report

## Week 5

- Topic 4: Environment, Culture and Collapse. Students will see how human population growth, consumption and urbanization challenged Mayan culture. They will carefully examine evidence for and against the idea that the demise of the great Mayan civilizations were from an unsustainable relationship with the environment. Students will consider other theories for the Mayan Empire collapse, including epidemic diseases, severe drought, foreign invasion, trade route collapse or an internal cultural collapse. They will explore how lack of livestock led to susceptibility to smallpox and other viral diseases once Europeans arrived. They will then consider how centuries between the Mayan collapse and European arrivals allowed for considerable ecological renewal.
- Workshop – Students use online resources to investigate and evaluate theories for why the Maya went extinct. They share their findings with one another. They consider how Mayan science and culture were unable to cope. Students also investigate the impact of European disease on Mayans during the colonial period.
- Discussion (graded participation) – Did the ancient Maya use their environment sustainably?
- Homework: Watch Apocalypso
- Readings
  - Abrams, E.M. and Rue, D.J. (1998) The causes and consequences of deforestation among the prehistoric Maya. *Human Ecology* 16, 377–395
  - Beach, T., Luzzadder-Beach, S., Dunning, N. and Cook, D., 2016. Climatic changes and collapses in Maya history. *Past Global Changes Magazine*, 24(2), pp.66-67
  - Smyth, M.P., Dunning, N.P., Weaver, E.M., van Beynen, P. and Zapata, D.O., 2017. The perfect storm: climate change and ancient Maya response in the Puuc Hills region of Yucatán. *antiquity*, 91(356), pp.490-509
- Assigned exercises and problems
- Weekly Quiz 4



- Essay on Apocalypto: Environmental themes and accuracy of the film

## Week 6

- Topic 5: Contemporary Mayan Culture and the Environment. Students explore Mayan culture and society after the European arrival and disease. They trace major historic events from the early Colonial period until now, including how the Mayan relationship with the environment has changed along the way. They explore more recent events, like the Guatemalan civil war, Mayan genocide and Mayan separation/isolation. They go on to see how much of current Mayan culture is informed by the ancient, and how modern science and technology is changing the Maya, as well as their relationship with their environment. Finally, students see how modern society can learn from Mayan traditions and practices to help build a sustainable future.
- Workshop: Students investigate the impact of European disease on Mayans during the colonial period. They will explore the biology of the diseases, their epidemiology, physiological impacts and how these diseases decimated what remained of Mayan civilization, society and culture.
- Guest Speaker: The contemporary Maya and their relationship to the Earth: religion, culture and science. Students will discuss current Mayan attitudes and their impacts on sustainability.
- Discussion (graded participation): Contemporary Mayan Culture and Environment
- Watch: Jared Diamond 2008. Why Societies Collapse. TED talk  
<https://www.youtube.com/watch?v=IESYMFtLlis>
- Readings:
  - Baines, K. and Zarger, R.K., 2017. "It's Good to Learn about the Plants": promoting social justice and community health through the development of a Maya environmental and cultural heritage curriculum in southern Belize. *Journal of Environmental Studies and Sciences*, 7(3), pp.416-424
  - Evans, S., 2012. King Henequen: Order, Progress, and Ecological Change in Yucatán, 1850-1950. *A Land Between Waters: Environmental Histories of Modern Mexico*, pp.150-172
  - González-Cruz, G., García-Frapolli, E., Casas, A. and Dupuy, J.M., 2015. Responding to disturbances: lessons from a Mayan socio-ecological system. *International Journal of the Commons*, 9(2), pp.831-850
  - Toledo, V.M., Garrido, D. and Barrera-Bassols, N., 2015. The struggle for life: Socio-environmental conflicts in Mexico. *Latin American Perspectives*, 42(5), pp.133-147
- Weekly Quiz 5
- Workshop Written Report
- Final Exam

## Course Materials

### Readings



- Abrams, E.M. and Rue, D.J. (1998) The causes and consequences of deforestation among the prehistoric Maya. *Human Ecology* 16, 377–395
- Anderson, E.N., 2016. Traditional and Nontraditional Medicine in a Yucatec Maya Community. In *Plants and Health* (pp. 1-16). Springer, Cham.
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- Beach, T., Luzzadder-Beach, S., Cook, D., Dunning, N., Kennett, D.J., Krause, S., Terry, R., Trein, D. and Valdez, F., 2015. Ancient Maya impacts on the Earth’s surface: An Early Anthropocene analog? *Quaternary Science Reviews*, 124, pp.1-30
- Beach, T., Luzzadder-Beach, S., Dunning, N. and Cook, D., 2016. Climatic changes and collapses in Maya history. *Past Global Changes Magazine*, 24(2), pp.66-67
- Boivin, N.L., Zeder, M.A., Fuller, D.Q., Crowther, A., Larson, G., Erlandson, J.M., Denham, T. and Petraglia, M.D., 2016. Ecological consequences of human niche construction: Examining long-term anthropogenic shaping of global species distributions. *Proceedings of the National Academy of Sciences*, 113(23), pp.6388-6396
- Chase, D.Z. and Chase, A.F., 2017. Caracol, Belize, and Changing Perceptions of Ancient Maya Society. *Journal of Archaeological Research*, 25(3), pp.185-249
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- Dussol, L., Elliott, M., Michelet, D. and Nondédéo, P., 2017. Ancient Maya sylviculture of breadnut (*Brosimum alicastrum* Sw.) and sapodilla (*Manilkara zapota* (L.) P. Royen) at Naachtun (Guatemala): A reconstruction based on charcoal analysis. *Quaternary International*, 457, pp.29-42
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- Islebe, G.A., Torrescano-Valle, N., Aragón-Moreno, A.A., Vela-Peláez, A.A. and Valdez-Hernández, M., 2018. The Paleoanthropocene of the Yucatán Peninsula: palynological evidence of environmental change. *Boletín de la Sociedad Geológica Mexicana*, 70(1)
- Lubman, D., 2015. On the acoustics of Maya pyramids. *The Journal of the Acoustical Society of America*, 137(4), pp.2427-2427
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- McNeill, J.R., 2003. Observations on the nature and culture of environmental history. *History and theory*, 42(4), pp.5-43
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- Perry, E., Marin, L., McClain, J. and Velazquez, G., 1995. Ring of cenotes (sinkholes), northwest Yucatan, Mexico: its hydrogeologic characteristics and possible association with the Chicxulub impact crater. *Geology*, 23(1), pp.17-20
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- Torrescano-Valle, N. and Folan, W.J., 2015. Physical settings, environmental history with an outlook on global change. In *Biodiversity and Conservation of the Yucatán Peninsula* (pp. 9-37). Springer
- Turner, B.L. II, Klepeis, P. and Schneider, L.C. (2003) Three millennia in the southern Yucatán peninsular region: implications for occupancy, use and carrying capacity. In: Gómez-Pompa, A., Allen, M., Fedick, S.L. and Jiménez-Osornio, J. (eds) *The Lowland Maya Area: Three Millennia at the Human– Wildland Interface*. Halworth Press, New York, pp. 361–387