American Public University System

The Ultimate Advantage is an Educated Mind

School of Science, Technology, Engineering & Math
Course Number: ERSC 402
Course Name: Earth and Planetary Sustainability
Credit Hours: 3
Length of Course: 8 weeks

Table of Contents

Instructor Information

Instructor information and information regarding
Office Hours are available in MyClassroom

Table of Contents

Course Description

Humans are a *part of* the natural ecosystem, not *apart from it*. We belong to a complex Earth system, and as such, we have a role to play in its sustainability.

This course will introduce students to the transdisciplinary study of Earth and Planetary Sustainability to understand processes that shape our planet (and others in the solar system) and to explore how human societies address and respond to planetary or global change. Students will examine the intersections of space and Earth science principles, Earth systems, spheres (geosphere, hydrosphere, biosphere, and atmosphere), cycles and interactions, human socio-ecological systems (social, environmental, economic, governance) along with applied solutions and innovations for Earth and planetary sustainability.

Students will explore key issues addressing environmental sustainability challenges on Earth today – including climate change, human population growth and overuse of resources, water scarcity, food security, energy, agriculture, biodiversity loss, and others – using planetary (i.e., space-based) perspectives and a socio-ecological systems framework – to study how human societies respond to global challenges. Our ability to find applied solutions – with technology, engineering, and innovations in response to these global challenges - is crucial to human development and survival. Sustainability principles on Earth can inform our exploration of space, mineral and water exploration, green innovations such as rocket re-use and space debris management, and applications of these on other terrestrial worlds, such as the Moon and Mars, and more. There are no pre-requisites for this course.

Table of Contents

Course Scope

This course presents major concepts, principles, and problems in environmental sustainability on a planetary (global) scale. In this course, students will examine sustainability using the transdisciplinary lenses of socio-ecological systems and global sustainability goals to examine environmental consequences of unsustainable resource extraction, consumption, and the prospects for future resource availability. Emphasis will be on applying the principles of sustainability through directed readings, discussions, and research/final project development. Students will be expected to use cross-disciplinary, systemic, and critical thinking skills as well as creativity and innovation to find solutions to challenging sustainability problems facing the U.S., the globe, and other terrestrial worlds such as the Moon and Mars.

The course empowers students to engage in critical thinking, communication, information literacy and academic skills that support creative decision-making and life-long learning. Issues of ***Earth and Planetary Sustainability*** are cross-disciplinary and can include:

- **Earth Sciences**: Physical geography, remote sensing and GIS; geology, rocks and mineral exploration, oceans, atmospheres, natural cycles, resource conservation, ecology, biology, hazards and disaster management, international studies, communications, sustainability ethics, socio-ecological systems, earth habitability, drones and UAVs, **and**
- **Space Studies**: Planets, solar system dynamics, impact craters, asteroids, meteorites, astronomy, habitable worlds, Earth observation technology (i.e., NASA's Earth Observatory), satellites, remote sensing, GIS, astrobiology and space medicine, astrophysics, robotics, aerospace science, rocket launch/recovery, telemetry, orbital

mechanics, and sustainable space exploration, including rocket re-use, space debris, cybersecurity, and governance for space exploration.

This is a required course for those in the Earth Sciences concentration of the Space Studies and Earth Sciences degree program.

Table of Contents

Course Objectives

Upon successful completion of this course students will be able to:

CO-1 Explain the principles of natural resource sustainability.
CO-2 Discuss society's use of natural resources, including traditional and renewable energy sources.
CO-3 Examine the human capacity for Earth system sustainability in the contexts of socio-ecological systems, global sustainable development, and green innovations such as rocket re-use.
CO-4 Evaluate methods by which individuals and societies can implement sustainable practices on Earth and other terrestrial worlds.

Table of Contents

Course Delivery Method

This course delivered via distance learning will enable students to complete academic work in a flexible manner, completely online. Course materials and access to an online learning management system will be made available to each student. Online assignments are due by Sunday evening of the week as noted and include Discussion forum questions (accomplished in groups through a threaded Discussion), quizzes, and individual assignments submitted for review by the Faculty Member). Assigned faculty will support the students throughout this eight-week course.

Table of Contents

Course Resources (Required)

The following **free open educational resources** are required to successfully complete this course. See Course Outline (pages 5-8 of this Syllabus) for specific chapters assigned from these texts each week. *NOTE: Select "newer version" on these text web sites when available*. *Expand "Contents" of each book to see book chapter headings.*

1. Theis, T. & Tomkin, J., Editors (2018). *Sustainability: A comprehensive foundation.* OpenStax CNX. Download and online book available from:

https://open.umn.edu/opentextbooks/textbooks/96.

2. University of California College Prep, AP Environmental Science. OpenStax CNX. Sep 25, 2009 http://cnx.org/contents/029742c1-d900-4187-87a5-b4bfb6f0ad16@2.1.
3. Fraknoi, A., Morrison, D., & Wolff, S. C. (2016). *Astronomy.* OpenStax CNX. Download and online book available from: https://openstax.org/books/astronomy/pages/1introduction.
4. Clark, M. A., Choi, J., & Douglas, M. (2018). Biology. OpenStax. Available from: https://openstax.org/details/books/biology-2e and https://openstax.org/books/biology2e/pages/1-introduction.
5. Larson, A. (2011). *Sustainability, innovation, and entrepreneurship*. Saylor Academy, 2012. Online book available from: Sustainability, Innovation, and Entrepreneurship | OER Commons.
6. Levin, H. L. (2017). *The Earth Through Time*. (11th ed.). Hoboken: Wiley. Online book available inside the classroom and via APUS' Trefry Library.
7. Supplemental readings provided in class (see weekly Content section of class).

Table of Contents

Evaluation Procedures and Grading

Reading Assignments: Reading assignments are specified in the Course Outline (next section of this Syllabus) and course Lessons each week. Make sure to complete the weekly readings before accomplishing class assignments (i.e., quizzes).

Discussions. There is a Discussion due each week of the course. You are required to post your own response to the question provided and to respond to at least two of your classmates in a substantive way. Your main post (i.e., your response to the discussion question posed to the class) must be at least 250 words; your two replies to classmates must be at least 100 words each (i.e., saying MUCH more than "good post" or "I agree"). Each Discussion is worth 3% of your course grade. Main posts are due Wednesdays at midnight Eastern time; replies to classmates are due Sundays by midnight Eastern time.

Project Assignment Series. There is a 4-part Assignment series in this class.

- Assignment 1 (due Week 2) is worth 2% - Topic
- Assignment 2 (due Week 3) is worth 7% - Annotated Bibliography
- Assignment 3 (due Week 5) is worth 12% - Outline
- Assignment 4 (due week 7) is worth 15% – Final Presentation

This is a "scaffolded" project, which means each assignment builds on the previous one. The Assignment series provides an opportunity for students to develop a deeper understanding of the topics covered in the class as well as the chance to develop writing and research skills.

Specific instructions can be found in the Assignment section of class. All content should be original and well-researched. Scholarly sources and APA format are required. APUS Trefry library is a great resource for finding appropriate works.

Quizzes. There are 8 quizzes due in this class, each worth 5% for a total of 40% of your course grade. Quizzes are based almost 100% on the reading material each week. Quizzes are **openbook;** however, you may not receive help from another person during the quiz or any other resources except your own notes and readings assigned. This is on the honor system; you are expected to act accordingly. Short answer questions should be answered in your own words, not copied from the text or any other source.

Late Work: Late work will be accepted up to 5 days late (maximum) past the due date before earning a zero score. Note: There is a 5% score deduction each day its late, unless you have prior instructor approval for an in-class extension.

Scoring Table (below) displays the point allocation for each assignment in class:

Classwork Assigned	% of Course Grade
Discussions (8) @ 3 pts each	24%
Quizzes (8) @ 5 pts each	40%
Assignment 1 (due Week 2)	2%
Assignment 2 (due Week 3)	7%
Assignment 3 (due Week 5)	12%
Assignment 4 (due Week 7)	15%
Total Course Points	**100%**

Please see the Student Handbook to reference the University's grading scale.

Table of Contents

8 – Week Course Outline

Please see the table below for the weekly readings and assignments due:

Week	Topic	Readings	Assignment

1	**The Big Picture of Our Living Planet** NASA on Earth and Planetary Sustainability: The Big Picture Earth and Planetary Sustainability: A Multi-Disciplinary Study Foundational Concepts of Sustainability A Review: The Formation of Earth and our Solar System How the Solar System Formed Space-Based Earth Observation (EO) The Space Environment and Sustainable Development on Earth The Scientific Method and Critical-Thinking	**Text Readings:** *Sustainability: A Comprehensive Foundation*, Chapters 1-3 (Forward, Preface, Chapter 3) *Astronomy.* Chapters 1, 4, 7, and 8 (8.1 and 8.2 only) *The Earth Through Time*. Chapter 8 **Topic Lecture** (Week 1) Supplementary Materials assigned (see "Readings and Resources")	"Academic Honesty" Statement Due (in Assignments) Discussion 1 due Quiz 1 due
2	**The Earth's System: Earth's Spheres and Cycles** Our Living Planet: Ecology, Biomes, Ecosystems, and Human Ecology Earth Spheres, including the Geosphere, Hydrosphere, Biosphere, and Atmosphere Energy through the Spheres Biogeochemical Cycles including Carbon, Nitrogen, and Hydrologic Cycles	**Text Reading:** *Sustainability:* Chapter 6 *Astronomy.* Chapter 8 (8.3, 8.4, and 8.5 only) *Environmental Science.* Chapters 1-5 *Biology.* Chapters 44 and 46 **Topic Lecture** (Week 2) Supplementary Materials assigned	Discussion 2 due Quiz 2 due Assignment 1: **Project Topic** Due (in Assignments)

3	**Planet Earth: An Interconnected Natural and Human System** Earth's Human Environments The Age of the Anthropocene Systems-Thinking and Sustainability Hot Topics in Planetary Sustainability: Population Growth and Food Security Socio-ecological Systems (SES)	**Text Reading:** *Sustainability:* Chapter 12 (12.1 and 12.4 only) *Biology.* Chapters 44, 45 and 47 *Sustainability, Innovation, and Entrepreneurship.* Chapters 1 and 4 (4.2 and 4.5 only) *Environmental Science*. Chapters 19 and 20 **Topic Lecture** (Week 3) Supplementary Materials assigned	Discussion 3 due Quiz 3 due Assignment 2 due: Annotated Bibliography
4	**The Human Footprint on Earth's System, Part 1** "Hot Topics" of Earth Sustainability: Global Climate Change Carbon Footprint, Greenhouse Effect, and Ozone Depletion Climate and Earth's Atmosphere, Moon and Space Climate Change Impacts to Earth's Socio-Ecological System	**Text Reading:** *Sustainability:* Chapters 5 and 11 (Sections 11.1, 11.3.2, 11.3.4 only) *Astronomy.* Chapters 7.2 and 10 **Topic Lecture** (Week 4) Supplementary Materials assigned	Discussion 4 due Quiz 4 due

5	**The Human Footprint on Earth's Systems, Part 2** "Tragedy of the Commons" The Human Condition and impact to Earth's socio-ecological system Inequity and Environmental Justice Disproportionate Adverse Impacts Health, Poverty, Education and Political Ecology "Hot Topics" in earth Sustainability Land Use Conversion, Deforestation and Biodiversity Loss Water Pollution Air Pollution and Acid Deposition	**Text Reading:** *Sustainability:* Chapters 7 and 8 *Environmental Science*. Chapters 16-18 and 2122 **Topic Lecture** (Week 5) Supplementary Materials assigned	Discussion 5 due Quiz 5 due Assignment 3 due: Outline
6	**Earth's Planetary Boundaries** Global-scale Ecosystem Services Planetary Boundaries The Quadruple Squeeze Tipping Points The Great Acceleration Intensely Managed Systems: Soils, Agriculture, and Pollution "Hot Topics" of Earth Sustainability: Resource (Over)Consumption and Planetary Boundaries.	**Text Reading:** *Sustainability:* Chapters 4, 9, and the following subsections: (3.5, 6.1, 6.4, and 12.3, 12.512.6 only) *Environmental Science*. Chapters 9, 11, 12, 15 and 24 **Topic Lecture** (Week 6) Supplementary Materials assigned	Discussion 6 due Quiz 6 due

7	**Onward and Upward Toward a Sustainable Earth System** Global Sustainable Development Goals (SDGs) Space as the 18th SDG: Extending Sustainability Beyond Earth Space Technology for Earth System Sustainability Earth System Science and Research Including Climate, Freshwater, Land Use Change, and Oceans by NASA, NOAA, USGS, and Others	**Text Reading:** *Sustainability:* Chapter 10 *Environmental Science*. Chapters 13, 22, 23, and 25 **Topic Lecture** (Week 7) Supplementary Materials assigned	Discussion 7 due Quiz 7 due Assignment 4 due: Final Project
8	**Applications for Earth and Planetary Sustainability** A Systems Approach to Earth and Planetary Sustainability Human Adaptation: Consumption and Footprints, Renewable Energies, and Circular Economies Innovations and Solutions for Earth Systems Sustainability, including Forests, Climate Action, Pollution, Sustainable Infrastructure, and Sustainable Energy SDGs, Policy and Action for Human Welfare, Sustainable Economies, Fair Governance Scaling Up Earth System Solutions for Sustainable Exploration of Earth, the Moon, Mars and Beyond	**Text Reading:** *Sustainability:* Chapter 13 *Environmental Science*. Chapter 14 *Sustainability, Innovation, and Entrepreneurship*. Chapters 2, 4, and 5 **Topic Lecture** (Week 8) Supplementary Materials assigned	Discussion 8 due Quiz 8 due

Table of Contents

Policies

Writing Expectations

All written submissions should be submitted in a font and page set-up that is readable and neat. It is recommended that students try to adhere to a consistent format, such as that described below.

- Typewritten in double-spaced format with a readable style and font and submitted inside the electronic classroom (unless classroom access is not possible and other arrangements have been approved by the professor).
- 12-point font in a style such as Arial, Helvetica or Times New Roman.

Citation and Reference Style

Assignment format must follow a widely accepted citation style, specifically APA. Please refer to the APUS Online Library for further examples or contact the instructor with questions.

Late Assignments

Students are expected to submit classroom assignments by the posted due date and to complete the course according to the published class schedule. As adults, students, and working professionals, I understand you must manage competing demands on your time. Should you need additional time to complete an assignment, please contact me **before the due date** so we can discuss the situation and determine an acceptable resolution. Routine submission of late assignments is unacceptable and may result in points deducted from your final course grade.

Netiquette

Online universities promote the advancement of knowledge through positive and constructive debate – both inside and outside the classroom. Forums on the Internet, however, can occasionally degenerate into needless insults and "flaming." Such activity and the loss of good manners are not acceptable in a university setting – basic academic rules of good behavior and proper "Netiquette" must persist. Remember that you are in a place for the rewards and excitement of learning which does not include descent to personal attacks or student attempts to stifle the Forum of others.

- **Technology Limitations:** While you should feel free to explore the full-range of creative composition in your formal papers, keep e-mail layouts simple. The Sakai classroom may not fully support MIME or HTML encoded messages, which means that bold face, italics, underlining, and a variety of color-coding or other visual effects will not translate in your e-mail messages.
- **Humor Note:** Despite the best of intentions, jokes and especially satire can easily get lost or taken seriously. If you feel the need for humor, you may wish to add "emoticons" to help alert your readers: ;-), :),

Communications

Student Communication

To reach the instructor, please communicate through the MyClassroom email function accessible from the Classlist of the Course Tools menu, where the instructor and students email addresses are listed, or via the Office 365 tool on the Course homepage.

- In emails to instructors, it's important to note the specific course in which you are enrolled. The name of the course is at the top center of all pages.
- Students and instructors communicate in Discussion posts and other learning activities.
- All interactions should follow APUS guidelines, as noted in the Student Handbook, and maintain a professional, courteous tone.
- Students should review writing for spelling and grammar.
- Tips on Using the Office 365 Email Tool

Instructor Communication

The instructor will post announcements on communications preferences involving email and Instant Messaging and any changes in the class schedule or activities.

- Instructors will periodically post information on the expectations of students and will provide feedback on assignments, Discussion posts, quizzes, and exams.
- Instructors will generally acknowledge student communications within 24 hours and respond within 48 hours, except in unusual circumstances (e.g., illness).
- The APUS standard for grading of all assessments (assignments, Discussions, quizzes, exams) is five days or fewer from the due date.
- Final course grades are submitted by faculty no later than seven days after the end date of the course or the end of the extension period.

University Policies

Consult the Student Handbook for processes and policies at APUS. Notable policies:

- Drop/Withdrawal Policy
- Extension Requests
- Academic Probation
- Appeals
- Academic Dishonesty / Plagiarism
- Disability Accommodations
- Student Deadlines
- Video Conference Policy

Mission

The mission of American Public University System is to provide high quality higher education with emphasis on educating the nation's military and public service communities by offering respected, relevant, accessible, affordable, and student-focused online programs that prepare students for service and leadership in a diverse, global society

Minimum Technology Requirements

- Please consult the catalog for the minimum hardware and software required for undergraduate and graduate courses.
- Although students are encouraged to use the Pulse mobile app with any course, please note that not all course work can be completed via a mobile device.

Disclaimers

- Please note that course content – and, thus, the syllabus – may change between when a student registers for a course and when the course starts.
- Course content may vary from the syllabus' schedule to meet the needs of a particular group.

Table of Contents

Online Library

The Online Library is available to enrolled students and faculty from inside the electronic campus. This is your starting point for access to online books, subscription periodicals, and Web resources that are designed to support your classes and generally not available through search engines on the open Web. In addition, the Online Library provides access to special learning resources, which the University has contracted to assist with your studies. Questions can be directed to **librarian@apus.edu**.

- **Trefry Library and Inter Library Loan:** The University maintains a special library with a limited number of supporting volumes, collection of our professors' publication, and services to search and borrow research books and articles from other libraries.
- **Electronic Books:** You can use the online library to uncover and download over 50,000 titles, which have been scanned and made available in electronic format.

- **Electronic Journals:** The University provides access to over 12,000 journals, which are available in electronic form and only through limited subscription services.
- **Tutor.com**: AMU and APU Civilian & Coast Guard students are eligible for 10 free hours of tutoring provided by APUS. Tutor.com connects you with a professional tutor online 24/7 to provide help with assignments, studying, test prep, resume writing, and more. Tutor.com is tutoring the way it was meant to be. You get expert tutoring whenever you need help, and you work one-to-one with your tutor in your online classroom on your specific problem until it is done.

Table of Contents