

CENTRAL TEXAS COLLEGE
ENVR 1401
ENVIRONMENTAL SCIENCE I

Semester Hours Credit: 4

INSTRUCTOR: _____

OFFICE HOURS:_____

I. INTRODUCTION

- A. “A survey of the forces, including humans, that shape our physical and biologic environment, and how they affect life on Earth. Introduction to the science and policy of global and regional environmental issues, including pollution, climate change, and sustainability of land, water, and energy resources.” - Academic Course Guide Manual (ACGM)
- B. This course can be used to meet the core requirements for AA/AS degrees and transfers to other Texas public colleges and universities for BA/BS degrees. This course also satisfies the science requirements in most curricula and may serve as preparation for careers in science.
- C. In support of the objectives of the Texas core curriculum, the course provides significant exercise of a student’s critical thinking skills, communication skills, teamwork, and empirical and quantitative skills. These objectives form a foundation of intellectual and practical skills that are essential for all learning.
 - * Critical thinking skills include creative thinking; innovation inquiry; analysis, evaluation, and synthesis of information.
 - * Communication skills include effective development, interpretation, and expression of ideas through written, oral, and visual means.
 - * Teamwork includes the ability to consider different points of view and to work effectively with others to support a shared purpose or goal.
 - * Empirical and quantitative skills include the ability to manipulate and analyze numerical data or observable facts to reach informed conclusions.
- D. Prerequisite: Appropriate placement score (at least a 350 on the math portion of the TSI) or TSI exemption or completion of the appropriate level of Developmental Studies course (DSMA 0303).

II. LEARNING OUTCOMES

Upon successful completion of this course the student will be able to:

- A. Recognize, describe, and quantitatively evaluate earth systems, including the land, water, sea, and atmosphere, and how these function as interconnected ecological systems.

- B. Assess environmental challenges facing humans caused by their interaction with the physical and biological environment (e.g., population growth, energy resources, food production, pollution, water and resource use).
- C. Acquire a scientific vocabulary and critical thinking skills related to environmental science.
- D. Assess the effectiveness and feasibility of environmental policy and its impact.
- E. Apply the scientific method to environmental investigation.
- F. Measure and observe aspects of the environment (e.g., air, water, soil) through sampling and sample analysis.
- G. Develop an assessment plan for an environmental case study.
- H. Demonstrate the collection, analysis, and reporting of data.

III. INSTRUCTIONAL MATERIALS

- A. Required instructional materials for lecture and lab: As noted in CTC Instructional Materials website, www.ctcd.edu/books

Book Title	Essential Environment: The Science Behind the Stories
Author	Withgott, Jay H.; Brennan, Scott R.
Edition	5th
Publisher	Pearson Custom
Copyright	2015
ISBN	9780134096520

- B. Course website: on BlackBoard, <https://ctc.blackboard.com/>; Free Microsoft Office 365: <http://office.com/getoffice365/> which includes Word and PowerPoint.

IV. COURSE REQUIREMENTS

- A. Class Participation: Students are expected to attend lecture and lab during their scheduled time. Leaving class early will be counted as an absence, unless it has already been excused. See section VII below for information on consequences of insufficient attendance. If there are multiple lecture sections, you may get permission to make up an excused absence.

- B. Laboratory Activities: Attendance and active participation in lab is required. There may be an occasional outdoor lab exercise. If there are multiple lab sections, you may get permission (in advance) to make up an excused absence.

V. EXAMINATIONS

A. Lecture Exams:

There are 4 lecture exams, each consisting of multiple-choice and true/false questions.

- Exams cover lecture material and related readings from assigned chapters. When studying be sure to read the chapters, review your lecture notes and do the chapter quizzes posted on BlackBoard.
- The only materials allowed to be used are a scantron and pencil. The exam must be completed within one hour and 20 minutes.
- If you miss a lecture exam, you have 2 days to make it up. Contact instructor to make arrangements for makeup as soon as possible. Regardless of excuse, 10% will be deducted if the make-up is taken within the first 24 hours, 20% if taken within second 24 hours. Any student may take the optional comprehensive lecture exam that will be given as the final lecture exam. If the grade on this exam is better, it will replace the grade of your lowest-scoring lecture exam.

B. Lab Quizzes:

There are 3 lab quizzes, each consisting of a mix of short answer, multiple choice, matching and true/false questions.

- Lab quizzes cover material in lab exercises. Therefore it is important to participate in lab; complete exercises; answer questions in lab manual; then check answers to those questions either in lab or on BlackBoard.
- The only materials allowed to be used are a pencil and calculator. An answer sheet will be provided. The exam must be completed within one hour and 20 minutes.
- If you miss a lab quiz, you have 2 days to make it up. Contact instructor to make arrangements for makeup as soon as possible. Regardless of excuse, 10% will be deducted if the make-up is taken within first 24 hours, 20% if taken within second 24 hours. Any student may take the optional comprehensive lab quiz that will be given as the final lab quiz. If the grade on this quiz is better, it will replace the grade of your lowest-scoring lab quiz.

VI. SEMESTER GRADE COMPUTATIONS

Your course grade is based on a total of 1000 points.

A: 900-1,000 B: 800-899 C: 700-799 D: 600-699 F: 000-599

assessment	grade (%)	point value	points earned
lecture exam 1		130	
lecture exam 2		130	
lecture exam 3		130	
lecture exam 4		130	
lab quiz 1		160	
lab quiz 2		160	
lab quiz 3		160	

Multiply percent grade by point value to get points earned. Add all points earned to get total number of points for course. (There is no extra credit.)

VII. NOTES AND ADDITIONAL INSTRUCTIONS FROM THE INSTRUCTOR

- A. Course Withdrawal: It is the student's responsibility to officially withdraw from a course if circumstances prevent attendance. To do so, complete and sign the Central Texas College Application for Withdrawal (CTC Form 59) any time prior to Friday the 12th week of classes during the 16-week fall and spring semesters. The deadline for withdrawal is published each semester in the Schedule Bulletin (<http://www.ctcd.edu/academics/class-schedules/>). A student may not withdraw from a class for which the instructor has previously issued the student a grade of "F" or "FN" for nonattendance.
- B. Administrative Withdrawal: An administrative withdrawal may be initiated when the student fails to meet College attendance requirements. An instructor may withdraw a student from a course if the student has more than 8 absences – lab and lecture combined. Such insufficient attendance may result in a grade of "FN" if the deadline for withdrawal has passed.
- C. Incomplete Grade: If a student has made satisfactory progress in a course with the exception of a major quiz, final exam, or other project, the instructor may – after reviewing documentation showing the reason for missed work – grant a temporary grade of incomplete, "IP". See current college catalog for more information.
- D. American's With Disabilities Act (ADA): Disability Support Services provide services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of

Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Explore the website at www.ctcd.edu/disability-support for further information. Reasonable accommodations will be given in accordance with the federal and state laws through the DSS office.

- E. Civility: Individuals are expected to be cognizant of what a constructive educational experience is and be respectful of those participating in a learning environment. Examples of uncivil conduct in class include, but are not limited to: eating, talking, sleeping; use of inappropriate language; use of electronic media for communication or entertainment; tardiness, leaving class early. Note that all of these activities distract other students and disrupt their learning experience. The offending student may or may not be given a warning before a CTC Counseling and Disciplinary Referral Form is filed and may receive disciplinary action up to and including expulsion. See Student Handbook for more information.
- F. Cheating: Students are expected to be familiar with the definitions and consequences of academic misconduct as stated in the Student Handbook. During a test students cannot leave the room or use unauthorized materials such as notes or cell phones.
- G. Instructor Discretion: The instructor reserves the right of final decision in course requirements.
- H. Courtesy: Students are expected to discuss any course-related issue or problem with their instructor first. If the problem has not been resolved at that level, students may contact the Head of the Science Department.

VIII. COURSE OUTLINE

A. CHAPTER ONE: SCIENCE AND SUSTAINABILITY

1. Learning Outcomes:

- a) Describe the field of environmental science
- b) Explain the importance of natural resources and ecosystem services to our lives
- c) Discuss the scale and consequences of population growth and resource consumption
- d) Describe the steps of the scientific method
- e) Comprehend the nature and importance of science, and characterize aspects of the process of science
- f) Appreciate the role of ethics in environmental science, and compare and contrast major approaches in environmental ethics
- g) Diagnose and illustrate major pressures on the global environment

- h) Articulate the concept of sustainability and describe campus sustainability efforts

2. Learning Assessment: Exam 1

B. CHAPTER FIVE: ECONOMICS, POLICY AND SUSTAINABLE DEVELOPMENT

1. Learning Outcomes:

- a) Explain the fundamentals of matter and chemistry, and apply them to real-world situations
- b) Explain how our economies exist within the environment and rely on ecosystem services
- c) Illustrate aspects of environmental economics and ecological economics, including valuation of ecosystem services and full-cost accounting
- d) Describe environmental policy and assess its societal context
- e) Explain the role of science in policymaking
- f) Discuss the history of U.S. environmental policy and summarize major U.S. environmental laws
- g) Define sustainable development and explain the triple bottom line

2. Learning Assessment: Exam 1

C. CHAPTER TWO: ENVIRONMENTAL SYSTEMS: MATTER, ENERGY AND ECOSYSTEMS

1. Learning Outcomes:

- a) Explain the fundamentals of matter and chemistry, and apply them to real-world situations
- b) Differentiate among forms of energy and explain the basics of energy flow
- c) Distinguish photosynthesis from cellular respiration and summarize the importance for both processes to living things
- d) Define ecosystems and evaluate how living and nonliving entities interact in ecosystem-level ecology
- e) Outline the fundamentals of landscape ecology and ecological modeling
- f) Assess ecosystem services and how they benefit our lives
- g) Describe how water, carbon, nitrogen, and phosphorus cycle through the environment, and explain how human activities affect these cycles

2. Learning Assessment: Exam 1

D. CHAPTER THREE: EVOLUTION, BIODIVERSITY, AND POPULATION ECOLOGY

1. Learning Outcomes:

- a) Explain the process of natural selection and cite evidence for this process
- b) Describe how evolution influences biodiversity
- c) Discuss reasons for species extinction and mass extinction events
- d) List the levels of ecological organization
- e) Outline the characteristics of populations that help predict population growth
- f) Explain logistic growth, carrying capacity, limiting factors, and other fundamental concepts in population ecology

2. Learning Assessment: Exam 1

E. CHAPTER FOUR: SPECIES INTERACTIONS AND COMMUNITY ECOLOGY

1. Learning Outcomes:

- a) Compare and contrast the major types of species interactions
- b) Characterize feeding relationships and energy flow, using them to identify trophic levels and construct food webs
- c) Distinguish characteristics of a keystone species
- d) Characterize disturbance, succession, and notions of community change
- e) Perceive the potential impacts of invasive species in communities, and offer solutions to biological invasions
- f) Explain the goals and methods of restoration ecology
- g) Identify and describe the major terrestrial biomes of the world

2. Learning Assessment: Exam 1

F. CHAPTER SIX: HUMAN POPULATION

1. Learning Outcomes:

- a) Describe the scope of human population growth
- b) Evaluate how human population, affluence, and technology affect the environment
- c) Explain and apply the fundamentals of demography
- d) Describe the concept of demographic transition
- e) Relate family planning, the status of women, and affluence to population growth

2. Learning Assessment: Exam 2

G. CHAPTER SEVEN: SOIL, AGRICULTURE, AND THE FUTURE OF FOOD

1. Learning Outcomes:

- a) Explain the challenges of feeding a growing human population

- b) Compare and contrast traditional, industrial, and sustainable agricultural approaches
- c) Identify the goals, methods, and consequences of the Green Revolution
- d) Explain the importance of soils to agriculture
- e) Analyze the causes and impacts of soil erosion and land degradation
- f) Explain the principles of soil conservation and provide solutions to soil erosion and land degradation
- g) erosion and land degradation
- h) Compare and contrast approaches to irrigation, fertilization, and pest management in industrial and sustainable agriculture
- i) Describe the science behind genetic engineering and evaluate the debate over its use
- j) Assess how we raise animals for food
- k) Analyze the nature, growth, and potential of organic agriculture

2. Learning Assessment: Exam 2

H. CHAPTER EIGHT: BIODIVERSITY AND CONSERVATION BIOLOGY

1. Learning Outcomes:

- a) Characterize the scope of biodiversity on Earth
- b) Specify the benefits that biodiversity brings us
- c) Understand today's extinction crisis in geologic context
- d) Evaluate the primary causes of biodiversity loss
- e) Assess the science and practice of conservation biology
- f) Analyze efforts to conserve threatened and endangered species
- g) Compare and contrast conservation efforts above the species level

2. Learning Assessment: Exam 2

I. CHAPTER NINE: FORESTS, FOREST MANAGEMENT AND PROTECTED AREAS

1. Learning Outcomes:

- a) Summarize the ecological and economic contributions of forests
- b) Outline the history and current scale of deforestation
- c) Assess approaches to resource management, describe methods of harvesting timber, and appraise aspects of forest management
- d) Identify federal land management agencies and the lands they manage
- e) Recognize types of parks and protected areas and evaluate issues involved in their design

2. Learning Assessment: Exam 2

J. CHAPTER TWELVE: FRESHWATER, OCEANS AND COASTS

1. Learning Outcomes:

- a) Explain water's importance to people and ecosystems, and describe the distribution of fresh water on Earth
- b) Describe the freshwater, marine, and coastal portions of the interconnected
- c) aquatic system
- d) Discuss how we use water and alter aquatic systems
- e) Assess problems of water supply and propose solutions to address depletion of fresh water
- f) Describe the major classes of water pollution, and propose solutions to address water pollution
- g) Describe legislation in the United States that addresses water quality
- h) Explain how we treat drinking water and wastewater
- i) Review the state of ocean fisheries and reasons for their decline
- j) Evaluate marine protected areas and reserves as innovative solutions for conserving biodiversity

2. Learning Assessment: Exam 3

K. CHAPTER FIFTEEN: NONRENEWABLE ENERGY SOURCES, THEIR IMPACTS AND ENERGY CONSERVATION

1. Learning Outcomes:

- a) Identify the energy sources that we use
- b) Understand the value of the EROI concept
- c) Describe the formation of coal, natural gas, and crude oil, and evaluate how we extract, process, and use these fossil fuels
- d) Assess concerns over the future decline of conventional oil supplies
- e) Outline ways in which we are extending our reach for fossil fuels and exploring unconventional new fossil fuel sources
- f) Examine and assess environmental, political, social, and economic impacts of fossil fuel use, and explore potential solutions
- g) Specify strategies for enhancing energy efficiency and conserving energy
- h) Describe nuclear energy and how we harness it
- i) Assess the benefits and drawbacks of nuclear power, and outline the societal debate over this energy source

2. Learning Assessment: Exam 3

L. CHAPTER SIXTEEN: RENEWABLE ENERGY ALTERNATIVES

1. Learning Outcomes:

- a) Discuss reasons for seeking alternatives to fossil fuels
- b) Outline the major sources of renewable energy and assess their potential
- c) for growth
- d) Describe solar energy and the ways it is harnessed, and evaluate its advantages and disadvantages

- e) Explain wind power and how we harness it, and evaluate its benefits and drawbacks
- f) Describe geothermal energy and the ways we make use of it, and assess its advantages and disadvantages
- g) List potential ocean energy sources and how we can harness them
- h) Clarify the scale, methods, and impacts of hydroelectric power
- i) Describe the major sources and techniques involved in bioenergy, along with their benefits and shortcomings
- j) Explain hydrogen fuel cells and weigh options for energy storage and transportation

2. Learning Assessment: Exam 4

M. CHAPTER THIRTEEN: ATMOSPHERIC SCIENCE, AIR QUALITY, AND POLLUTION CONTROL

1. Learning Outcomes:

- a) Describe the composition, structure, and function of Earth's atmosphere
- b) Relate weather and climate to atmospheric conditions
- c) Identify major pollutants, outline the scope of outdoor air pollution, and assess strategies for pollution control
- d) Explain stratospheric ozone depletion and identify steps taken to address it
- e) Explain acid deposition, illustrate its consequences, and articulate how we are addressing it
- f) Characterize the scope of indoor air pollution, and assess solutions

2. Learning Assessment: Exam 4

N. CHAPTER FOURTEEN: GLOBAL CLIMATE CHANGE

1. Learning Outcomes:

- a) Describe Earth's climate system and explain the factors that influence global climate
- b) Identify greenhouse gases and characterize human influences on the atmosphere and on climate
- c) Summarize how researchers study climate
- d) Outline current and future trends and impacts of climate change in the United States and across the world
- e) Suggest and assess ways we may respond to climate change

2. Learning Assessment: Exam 4