# San José State University
# Department of Geography and Global Studies
# GEOG 1, Geography of the Natural Environment, Section 80, Spring 2019

**Course and Contact Information**


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**Class Days/Time**: online

**Classroom**: none

**GE/SJSU Studies Category**: Area B1

**Course Format**

This is an online course. Internet connectivity and a computer are required.

Course materials (including this syllabus) can be found on Canvas Leaning Management System course login website at http://sjsu.instructure.com, under **Files**. Assignments are all listed and described under **Assignments**. Additional discussion will be provided under **Announcements**. You may communicate with me privately as much or as little as you want, through CANVAS messaging. I may provide feedback on particular assignments, but I encourage you to continue such conversations outside of that particular assignment, which I am unlikely to check back on once it's graded.

**Course Description**

This course covers the basic sciences that describe the Earth's atmosphere, hydrosphere, biosphere, and lithosphere.

**Course Goals and Learning Outcomes**

This course is approved for General Education Core Physical Science area, B1. Upon successful completion of this course, students will be able to:

1: use the methods of science and knowledge derived from current scientific inquiry in life or physical science to question existing explanations.

Evidence-based learning and discovery form the basis of scientific inquiry. The focus of this class is therefore on evidence, rather than belief. Challenges to existing explanations are approached through examination of evidence.

2: demonstrate ways in which science influences and is influenced by complex societies, including political and moral issues.

The technical and cognitive methods of understanding used by researchers in physical geography are described throughout the course. The goal of achieving relative independence of the natural sciences from social belief systems is recognized, as is the influence of such belief systems on the process of achieving that goal. The influence of the resulting

comprehension of natural systems on human societies is emphasized throughout the course, particularly with regard to natural disasters like earthquakes, as well as the complex impact of climate change on social systems.

3: recognize the methods of science, including quantitative, analytical reasoning techniques.

The tools and methodologies of the physical geographical sciences, as well as the analytical and algorithmic reasoning techniques, are studied in some detail. Students shall understand how knowledge is achieved and improved on an ongoing basis.gh time; systems of classification; and physical processes of the natural environment.

**Textbook**

The **Fundamentals of Physical Geography** (2nd edition) is a free online textbook with over 300 pages and 400 illustrations, photos and animated graphics. It is the work of two professors from the University of British Columbia Okanagan – Dr. Michael Pidwirny & Scott Jones. Important terms are hyperlinked to a glossary. There are links to study guide pages and additional reading within each chapter. Most importantly, 'weblinks' are provided for each chapter that provide a wealth of well-respected sources of additional data and social media

**Additional Readings**

climatechangeindicatorsreport2013.pdf
StayingSafeWhereTheEarthShakes_BayArea.pdf
PuttingDownRootsInEarthquakeCountry_BayArea.pdf

These files are all available from Canvas, under Files. Alternative measn of downloading them are described in the Course Schedule, below.

**Other technology requirements**

A device capable of streaming video from the Internet is required for this course. You should use a computer with a large screen if possible; I do not recommend that you watch the videos on your phone. Most of these streaming videos (including my own) are being offered in high definition. Your computer and Internet connection should be sufficiently powerful to portray them at the original resolution.

**Videos**

Online videos are a big part of this course, and much of the homework will be judged on the basis of how closely you considered them in your discussions. If you are accessing each assignment through CANVAS **Assignments**, you might be given the choice of opening a video in a separate browser or of watching it within CANVAS. I suggest you open videos in separate browsers and possibly take notes as you watch; that is why a bigger screen is preferable. Separate browsers often also provide additional information, as well as full access to other material on the author's channel. I encourage you to explore the work of any YouTube contributor whose work you appreciate.

However, you might want to open videos by clicking on the embedded option within CANVAS (if access is offered), and read over the assignment as you watch. It's up to you. I've included some of my own videos in the homework, and I might provide links to others in the **Announcements**. I'm working on narration.

Some YouTube videos may be preceded by ads. Usually, these ads can be cut short by clicking on 'Skip Ad' at the lower right of the screen. There are never ads on my videos, and I get absolutely no monetary benefit from YouTube.

There is a great deal of excellent educational material on the Internet, but you have to search for it. The best isn't often easy to find. If you have any suggestions or discoveries that you think I might appreciate, please let me know. But nothing politically partisan please, one way or the other.

**Course Requirements and Assignments**

Your responsibilities for this course lie entirely in submitting homework assignments and a final evaluation. I encourage you to discuss any relevant matter with me via CANVAS messaging. You may do so as much or as little as you like. Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week) for preparation/studying or course related activities.

## Homework Assignments

Please submit your homework responses within Canvas Assignments for this course. Word or pdf files are acceptable. Please keep file sizes reasonable. Use either 10 or 12 point font (or both), with 1 ½ line spacing and normal margins. Please include the following information at the upper right of the first page of each homework submission:

Your name
Geog1-80
Spring 2019
Homework #

Figures, images, and quotations from the references listed here or from other sources may be embedded in your homework responses, but you must provide attribution. Citations should be explicit and complete.

Regarding the length in pages or word count expected for each assignment: this depends on the topic and your writing style. I'm looking for understanding, substance, and a willingness to sufficiently pursue each point you are making. Each assertion should be supported by evidence; in fact, you should be spending more time in discussing evidence (for and against particular claims) than in making assertions. It is perfectly reasonable to be unsure about topics that you are just beginning to understand. This is a course in science. Doubt and uncertainty are virtues. I want only reflections of science from you. If your writing style is average, and you avoid redundancy, each homework assignment should run at least three pages.

You will be graded relative to the performance of your classmates in the current and former semesters. I may offer comments or advice in CANVAS for each assignment. Check back on each assignment not only for your grade, but also for any comments I may have left. If you'd like to continue the conversation (which I welcome) please do so as a CANAS message to me independently of that particular assignment, which I am unlikely to check back on.

**Final Evaluation**

In at least four to five pages (10pt font, 1 ½ spaced as usual), you will be asked to describe steps that might be taken before, during, and after a major destructive earthquake, from the perspective of a family member, and/or neighbor, public servant, health care worker, business officer, planner, etc. in order to reduce suffering and loss. Hopefully, this will never happen to you. But living where we do, we all need to take this seriously. That's why I've chosen this topic in place of a comprehensive test. A full description is provided in the Course Schedule below.

**Grading Information**

Homework: Fifteen homework assignments and the Final Exam must be completed on or before the due dates, as described in the Course Schedule below. Please submit these responses via Canvas.

**Determination of Grades**

| | |
|---|---|
| Homework assignments (6% each) x 15 | 90% |
| Final Evaluation | 10% |
| **Total** | **100%** |

| | |
|---|---|
| 98% and above | A+ |
| 94% - 97% | A |
| 93% - 90% | A- |
| 89% - 87% | B+ |
| 86% - 84% | B |
| 83% - 80% | B- |
| 79% - 77% | C+ |
| 76% - 74% | C |
| 73% - 70% | C- |
| 69% - 67% | D+ |
| 66% - 64% | D |
| 63% - 60% | D- |
| **below 60%** | **F** |

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 at http://www.sjsu.edu/senate/docs/S12-3.pdf.

Note that "All students have the right, within a reasonable time, to know their academic scores, to reWatch their grade-dependent work, and to be provided with explanations for the determination of their course grades." See University Policy F13-1 at http://www.sjsu.edu/senate/docs/F13-1.pdf for more details.

**University Policies**
Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/

# Geog1-80 / Geography of the Natural Environment / Spring 2019

## Course Schedule

| Week | Due Date | Readings, Assignments |
|---|---|---|
| 1 | | **Topic:** The nature of Nature<br><br>I want to begin the semester by positing that science, like art, is often a very personal endeavor. It is something that people very often do out of love, above all. And just like with art, we can all derive satisfaction just from what other people have done. The personal connection I feel with the topics in this course, and with the sciences generally, it's not exceptional in any way. It is quite natural to try to understand the true nature of things, and to question what we are told. In the short time each of us has to live, we can each come to understand a great deal, if we try. True wisdom can only come from such understanding. That is what I will try to demonstrate in this course.<br><br>First of all, I'm nothing special. I haven't published as much as I should (yet). I'm often uncertain about my own ideas and find them to be incomplete. But I grew up in the shadow of Sputnik, when the federal government unapologetically encouraged young people to study science and mathematics. Some kids took to it, and some didn't. I loved it. I found opportunities to work and play with all kinds of materials, chemicals, instruments and devices. I peered through microscopes at school. I peered through telescopes at the community college. I experimented with electronic devices and instruments and built things out of vacuum tubes, transistors, and eventually integrated circuits. The NASA manned missions were incredibly dangerous and fascinating, and I probably watched every flight. As an adult, I supported myself and later my family as a technician, engineer and programmer at three different universities, a couple of businesses, and a federal research facility. I had the privilege of working alongside some outstanding scientists in a variety of fields. But my life is not unusual. Lots and lots of people around the world, of every race, gender, and ethnicity, have had similar careers. I hope all young people are encouraged to lead lives in science. As I see it, that's my mission with this course. And if humanity manages to pull through its current difficulties, it will be on the basis of our understanding of Nature, which as we know bats last.<br><br>**Watch at least part of:** Eye of the Universe - Mandelbrot Fractal Zoom<br>https://youtu.be/pCpLWbHVNhk<br><br>**Watch at least part of:** Sapphires - Mandelbrot Fractal Zoom<br>https://youtu.be/8cgp2WNNKmQ<br><br>The Mandelbrot Set is a mapping onto the complex number plane (defined along one axis by real numbers, and along the other axis by fractions of the square root of -1). This mapping is generated by iterating a simple equation for each specific point on this plane, and determining whether the solution converges. The solution is pictured in these videos, which zoom in to specific points in the plane. The only human input is the palette of colors and shades used to portray the solution, the precise point on the complex plane into which we zoom, the zoom rate, and the rectangular region around that point that we portray at each moment. Mathematically, this zoom process can go on forever. In nature, such self-similar patterns emerge over a given range of scales. Think about the complexities of trees, clouds, or ripples in a stream, which exists *despite* the simplicity of their underlying physical processes. These films also illustrate how the arts and sciences can intertwined, with no contradictions between them.<br><br>**Week 1 (homework 1: due 1/28) continues on next page.** |

| Week | Due Date | Readings, Assignments |
|---|---|---|
| | | **Watch:** Powers of Ten Ultimate Zoom<br>https://youtu.be/Fl6qnZzVRAU<br><br>**Watch:** The most special stars Hubble has ever seen \| Part 7<br>https://youtu.be/BiMiQVM6FEo<br><br>**Watch:** New and Extraordinary Hubble Discoveries 4K \| Part 6<br>https://youtu.be/TpOwwe97PU4<br><br>Astronomy and cosmology are among those fields of science that are experiencing a huge burst of discovery at this time. We have new kinds of detectors that can sense gravitational waves resulting from the collisions of black holes far across the universe billions of years ago. These videos discuss discoveries derived from images taken by the Hubble Space Telescope. The James Webb Space Telescope will be its successor and will provide greatly improved resolution and sensitivity. It is scheduled to be launched on March 30, 2021.<br><br>The rate at which science has expanded out awareness and understanding of the reality we find ourselves in has itself grown enormously in my lifetime, and the questions that this new awareness has generated have themselves grown in number and significance. For example, we are now aware of the existence of some kind of real substance that occupies space and interacts with ordinary matter gravitationally, but is otherwise non-interactive and invisible; it makes up most of our universe, but we don't know what it is. We are aware of the existence of some energetic force that drove space itself to expand at greater than light velocities after the Big Bang, but we don't know what it is. They've only been given names: dark matter and dark energy.<br><br>**Watch:** Scientists explain what a Tipping Point is<br>https://youtu.be/Zx9uMIVni40<br><br>This video provides a brief introduction to the concept underlying the possibility of sudden change that can result from the long-term evolution of a system. After experiencing such events, the system might begin operating in a very different way: its 'regime' will have changed. This happens with engineered systems, nonhuman physical systems, biological systems, ecosystems, and even human societies. In terms of the system's overall health, these changes could be good or bad. So if we understand when, where, and how they might occur, we can try to avoid the bad ones, and encourage the good ones. |
| | **1/28/2019** | **Homework 1:**<br>Thanks for bearing with me so far. In return, Homework 1 should not be very time consuming. Nothing to look up; just give it some thought.<br><br>1. After watching the Mandelbrot and Powers of Ten videos, discuss how something examined at one scale can appear to be both similar and different from the same thing examined at another scale, and why we might need different sciences to represent what might be essentially the same thing.<br><br>2. What is a tipping point, and why do you think it might be important to understand tipping points in the context of this class? Discuss occurrences of nonlinearities, thresholds, and surprises in your own life if you can, and why it might be important to keep them in mind when discussing the relationship of humanity with the Earth's natural systems. |

| Week | Due Date | Readings, Assignments |
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| **2** | **2/04/2019** | **Topic:** Endeavors in Science<br><br>Before entering into the standard sequence of topics for an introductory course in physical geography, I'd like to take one more week to allow you the freedom to express to me what sorts of topics in science and technology interest you, through a set of short films produced by local broadcaster KQED.<br><br>**Watch:** Look through the many pages of relatively short videos available at the following address. Use the 'next page' button at the bottom of each page to access additional pages.<br><br>http://ww2.kqed.org/quest/tag/tag-video/<br><br>**Homework 2:** Choose any five videos, and write (using at least ½ of a page per video), a summary and brief discussion of what you found most interesting about each of them and any questions they bring to mind. Indicate the title of each video as subheadings. Make sure to look through a few pages before making your selections. Don't just stick with the first couple of pages. |
| 3 | **2/11/2019** | **Topic:** Cartography and technology<br><br>Access the text Fundamentals of Physical Geography<br>http://www.physicalgeography.net/fundamentals<br><br>**Read** CHAPTER 2: Maps, Remote Sensing, and GIS<br><br>Each chapter of the online text **Fundamentals of Physical Geography** includes a Study Guide page. At the bottom of each Study Guide page is a list of Essay Questions. Responses to questions from the book may be partially copied and pasted from the text. Take your answers, at least in part, from the section of that chapter that discusses the topic at hand. Do NOT take them from the summary of the chapter. Use your own words at least half the time. Not all questions require a long response, but some do. Use your own judgement, put in the time, and revise your approach in light of your grade and any feedback I might give on each assignment.<br><br>**Homework 3:**<br><br>Chapter 2 Essay Questions: 1, 7, 8, 9:<br><br>2.1. What is a map? What two basic forms do they come in? How are projection systems used to portray the Earth's surface on a map? What problems are associated with projecting the Earth's surface on a two-dimensional map?<br>2.7. What is a topographic map? How does it use maps symbols to represent natural and human constructed features found in the environment? Why are contour lines found on this type of map and how are they used?<br>2.8. What is remote sensing? What types of remote sensors have been developed to monitor the Earth? Describe some of the guiding principles of object identification that are used for feature recognition.<br>2.9. What is a GIS? What types of activities are carried out on these computerized systems? |

| Week | Due Date | Readings, Assignments |
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| 4 | **2/18/2019** | **Topic:** Energy<br><br>**Watch:** A guide to the energy of the Earth<br>https://youtu.be/fHztd6k5ZXY<br><br>**Read** CHAPTER 6: Energy and Matter<br><br>**Homework 4:**<br>1. Describe some internal and external sources of energy for the Earth.<br><br>Chapter 6 Essay Questions 3, 4, 5, 6, 7, 9 , 10, 11, 12:<br>6.3. How do the three mechanisms of conduction, convection and radiation move energy from one place to another?<br>6.4. Outline the three laws of thermodynamics.<br>6.5. What is radiation? How is it created? What factors determine its quantity and quality?<br>6.6. Define the Stefan-Boltzmann Law. What does it describe?<br>6.7. Define Wien's Law. What does it describe?<br>6.9. How does the Sun create the energy that drives most systems on the Earth?<br>6.10. How does the tilt of the Earth's axis influence the annual solar insolation received at a site located at 50 degrees North latitude?<br>6.11. What influence does Earth rotation have on solar insolation received at the equator?<br>6.12. How does angle of incidence control the intensity of solar radiation received at the Earth's surface? |
| 5 | **2/25/2019** | **Topic:** The Atmosphere<br><br>**Watch:** Careers In Atmospheric Science<br>https://youtu.be/Fk-uqrXkkG8<br><br>**Read** CHAPTER 7: Introduction to the Atmosphere<br><br>**Homework 5:**<br>1. Describe the career(s) in atmospheric science from in the video that you find most interesting.<br><br>Chapter 7 Essay Questions 3, 4, 5, 6, 7, 10, 13, 15, 21<br>7.3. Why is ozone important for life on Earth? Where is it found and how is it formed? How is human activity influencing this important atmospheric gas?<br>7.4. How is the incoming shortwave solar radiation from the Sun modified by the atmosphere and the Earth's surface?<br>7.5. Describe the difference between the following two terms: heat and temperature.<br>7.6. Describe the shortwave radiation cascade as it relates to the Earth's energy balance.<br>7.7. Discuss how the Greenhouse Effect works. How has human activity over the last few centuries enhanced this natural process? How will global warming change the environment of the Earth?<br>7.10. What is a hurricane? Where, when and why does it form? How is global warming likely to influence hurricane intensity and frequency?<br>7.13. Discuss the formation and characteristics of the various types of thunderstorms.<br>7.15. What factors are responsible for the altered micro-climate of urban areas?<br>7.21. Why do urban areas have more energy available for the creation of sensible heat than rural areas? |

| Week | Due Date | Readings, Assignments |
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| 6 | **3/04/2019** | **Topic:** The Atmosphere<br><br>**Watch:** Water Vapor Fuels Hurricane<br>https://ca.pbslearningmedia.org/resource/nves.sci.earth.hurricane/water-vapor-fuels-hurricanes/<br><br>**Watch:** NOVA: Earth From Space \| Monitoring Earth's Water Vapor<br>https://ca.pbslearningmedia.org/resource/nves.sci.earth.vapor/monitoring-earths-water-vapor<br><br>**Homework 6:**<br><br>1. What is the primary function of the Aqua satellite? How does it monitor the production of water vapor?<br>2. Why might molecules of water vapor be described as "little mobile solar collectors"?<br>3. Describe the role of the Sun in the formation of thunderstorms.<br>4. What is a geostationary orbit? Why do you think it would be useful to have a satellite remain in orbit over one point on Earth? Why do scientists combine data from multiple satellites in geostationary orbit?<br>5. Explain how topography, latitude, and other factors combine to change the impact of water vapor regionally. |
| 7 | **3/11/2019** | **Topic:** Climate Change<br><br>We will repeatedly explore topics in climate because they are directly relevant to the central themes of this course. I will ask you to demonstrate a reasonable grasp of what the relevant sciences are in the process of discovering. We will explore more fully the sciences of weather and climate later in this course, but I would like to introduce the topic through the following conversation.<br><br>**Watch:** NOVA: Extreme Ice \| Ice-Core Record of Climate<br>https://ca.pbslearningmedia.org/resource/nvei.sci.earth.climate/ice-core-record-of-climate/<br><br>**Watch:** Climate Change and Population<br>https://youtu.be/Q5gDij1O1AE<br><br>**Homework 7:**<br><br>1. What is an ice core?<br>2. What happened to the level of carbon dioxide in the atmosphere about 125,000 years ago?<br>3. What is the relationship between greenhouse gases in the atmosphere and global temperatures and sea level?<br>4. Tell me who Brian O'Neill is (do a Google search), and summarize the discussion in the second video in such a way as to convince me that you've listened to it carefully. This should take at least a couple of pages. |

| Week | Due Date | Readings, Assignments |
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| 8 | **3/18/2019** | **Topic:** The Hydrosphere<br><br>**Read** CHAPTER 8: Introduction to the Hydrosphere<br><br>**Watch:** Is the world's fresh water supply running out?<br>https://youtu.be/iVcTQdOJMMw<br><br>**Watch:** Water Resource Management<br>https://youtu.be/odngssDFMrU<br><br>I worked for a couple of years for the National Operational Hydrologic Remote Sensing Center, or NOHRSC (https://www.nohrsc.noaa.gov) which is NOAA's "source for snow information" and other hydrological data products and models. Every winter day, several satellite datasets are downloaded to this facility and analyzed, and by evening a variety of maps and graphs are generated and uploaded onto the Internet for use by regional hydrological agencies, businesses, and others to inform their own work and decisions. One important variable that has to be mapped and used to forecast springtime flooding is called 'snow water equivalent', or SWE, which gauges the volume of liquid water that would result from melting a given area of snow cover. This can be checked manually on the ground at various points using automated 'snow pillows' and other devices, but it can also be checked from above. NOAA pilots run low altitude flight-lines over snow with instruments that estimate SWE by measuring the degree to which the natural radioactivity of the ground beneath is dampened, or attenuated. These NOAA Corps pilots travel all over the world gathering data and assisting researchers; one in our office had once overwintered at the South Pole.<br><br>**Homework 8:**<br><br>1. What is an aquifer, and what is the current state of aquifers around the world? Where is the problem worst?<br>2. What are some of the careers described in the video on water resources management?<br><br>Chapter 8 Essay Questions 1, 3, 4, 5:<br>8.1. What is streamflow? How can it be expressed in a mathematical model? Describe the effect of an intense 1 hour storm on streamflow over 24 hours using a hydrograph.<br>8.3. Discuss the movement of water into soils. How and why does infiltration vary with time?<br>8.4. Why does runoff occur?<br>8.5. What forces influence the storage of water in the soil matrix?<br><br>I've been drawn to rivers and streams all my life, and I seek them out wherever I go. The following videos are among a few I made a couple of years ago on a cruise up the Yangtze River in China.<br><br>The Three Gorges Dam<br>https://youtu.be/pPKV_GTI4gk<br><br>The Three Gorges<br>https://youtu.be/yQ7lrqE_bKU<br><br>Little Three Gorges of the Daning River<br>https://youtu.be/ZY9Ug2CXFwo |
| 9 | **3/25/2019** | **Spring Recess** |

| Week | Due Date | Readings, Assignments |
|---|---|---|
| 10 | **4/01/2018** | **Topic:** The Hydrosphere<br><br>**Read** CHAPTER 8: Introduction to the Hydrosphere<br><br>**Watch:** The Water Cycle<br>https://youtu.be/al-do-HGuIk<br><br>**Homework 9:**<br><br>1. Describe the global water cycle in terms of flows and stores.<br><br>Chapter 8 Essay Questions 7, 10, 12, 16<br><br>8.7. Describe the mathematical equation used to model stream discharge.<br>8.10. What is potential evapotranspiration and how does it differ from actual evapotranspiration? What factors control the rate at which water leaves the Earth's surface by way of evaporation and transpiration?<br>8.12. Explain how relative humidity is measured.<br>8.16. Discuss how tides form. What is the difference between a Neap and Spring tide? Explain diurnal, semidurinal, and mixed tides. |
| 11 | | **Topic:** The Biosphere<br><br>**Watch:** Plants Affect the Atmosphere<br>https://ca.pbslearningmedia.org/resource/nves.sci.earth.atmosphere/plants-affect-the-atmosphere/<br><br>**Read** CHAPTER 9: Introduction to the Biosphere<br><br>The borders of the biosphere, that portion of the Earth occupied by living things, have been revised significantly in recent years. Life has been found high in the atmosphere, deep within the crust, and deep in the ocean, particularly around hydrothermal vents. Much of this newly found life derives its energy not from the sun, but from the Earth itself. We will return to this topic later, when we talk about the oceans.<br><br>Most life on Earth gets its energy from the sun, either directly or indirectly, via an evolved set of processes called photosynthesis and respiration. Carbon dioxide is required, and water and oxygen are released, globally, on a massive scale. Living things therefore are key determinants of just how much carbon is in the atmosphere, and so they are largely responsible for the sort of climate that has evolved on this planet. In order to fully understand climate, we have to understand life. We can change the direction that the world climate takes in the future, one way or another, depending on how well we understand and treat living things.<br><br>We couldn't possibly cover the vast complexity of life in a couple of short weeks. I recommend that you take courses and read books about the relevant sciences. I believe that the accelerated rate of global species extinction in particular is a problem that we should all be concerned about. It is also a problem that individual human beings can do much to alleviate.<br><br>**Week 11 (homework 10: due 4/08) continues on next page.** |

| Week | Due Date | Readings, Assignments |
|---|---|---|
| | **4/08/2018** | **Homework 10:**<br><br>1. What primary components of Earth's atmosphere do plants modify through photosynthesis and respiration?<br>2. How do photosynthesis and respiration relate to one another?<br>3. How have plants contributed to making Earth a habitable planet?<br>4. Describe how Earth's atmosphere changes over the course of 24 hours.<br>5. Why does the Amazon rainforest have such a dramatic impact on the atmosphere?<br><br>Chapter 9 Essay Questions 2, 3, 5, 9, 10<br><br>9.2. Compare and contrast the function and structure of the grazing and detritus food chain.<br>9.3. What is an ecosystem? How does it differ from a community? What are some of its important components?<br>9.5. Explain in detail how energy moves through the grazing food chain and the detritus food chain. Also, discuss how these food chains are related to each other and are necessary for the cycling of nutrients in an ecosystem.<br>9.9. What are some of the major components of ecosystems? How are these components related to each other?<br>9.10. Describe how energy flows through ecosystems. |
| 12 | **4/15/2019** | **Topic:** The Biosphere<br><br>**Read** CHAPTER 9: Introduction to the Biosphere<br><br>**Watch:** NOVA: Earth From Space \| Lightning Produces Nitrates<br>https://ca.pbslearningmedia.org/resource/nves.sci.earth.nitrate/lightning-produces-nitrates/<br><br>Besides a source of energy and water, life depends on the presence of a few other elements, particularly nitrogen. However, most living things cannot get this nitrogen directly from the air; the get it indirectly from specialized microbes, as well as from lightening. Another direct link between the biosphere and the atmosphere that most of us are unaware of.<br><br>**Homework 11:**<br>1. On average, how many lightning strikes occur on Earth each second?<br>2. Describe how lightning forms.<br>3. How does lightning produce nitrate?<br>4. Why is nitrate important for living things?<br>5. How does nitrate produced in clouds end up in human bodies?<br><br>Chapter 9 Essay Questions 11, 14, 4:<br>9.11. Discuss the term dispersal. Include in your answer an explanation of why organisms want to disperse, and how organisms accomplish this life-cycle strategy.<br>9.14. Compare and contrast the characteristics (climate, plant types, animal life, soil types, etc.) of the following biomes: Tundra, Temperate Deciduous Forest, Desert, and Tropical Rainforest.<br>9.4. Evolution describes the process by which species come to possess adaptations. In an essay, describe how evolution works through natural selection, spatial isolation, and gene mutation. |

| Week | Due Date | Readings, Assignments |
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| 13 | **4/22/2019** | **Topic:** The Lithosphere<br><br>**Access via CANVAS (Files):** StayingSafeWhereTheEarthShakes_BayArea.pdf<br>PuttingDownRootsInEarthquakeCountry_BayArea.pdf<br><br>**Read:** CHAPTER 10: Introduction to the Lithosphere<br><br>**Homework 12:**<br><br>1. In an essay, describe steps that should be taken before, during, and after a major destructive earthquake, from the perspective of you as a family member and/or neighbor, public servant, health care worker, business officer, planner, etc. in order to reduce suffering and loss. In other words, I want to know more than just what you would do for yourself during and immediately after the earthquake. I also want to know about long-term planning, and about the long-term aftermath.<br><br>Assume that the earthquake has caused casualties, and that people around you are in need of first aid, at the very least. Assume that gas lines are ruptured, that electricity is off, and that communications via cell phone is unreliable. Assume that you have the ability to move and do things. You may be at work, or school, at home or on the streets. You may fictionalize your account, with specifics, or you may write in the manner of the USGS documents. This essay should take at least a couple of pages.<br><br>Chapter 10 Essay Questions 6, 12, 13, 14:<br>10.6. What geologic features are found at the boundaries of tectonic plates? Briefly explain how plate tectonics is responsible for their formation or occurrence.<br>10.12. Describe the various layers that make up the solid Earth.<br>10.13. Describe the various physiological features associated with the ocean basins.<br>10.14. What is a volcano? Where and why do they form? Describe the five different types of volcanoes. |
| 14 | **4/29/2019** | **Topic:** The Lithosphere<br><br>**Read:** CHAPTER 10: Introduction to the Lithosphere<br><br>**Homework 13:** Essay Questions 17, 20, 21, 25, 28, 32, 33, 34<br><br>10.17. Outline the various processes of physical, chemical, or biological weathering.<br>10.20. Describe the physical characteristics of a location that would favor each of the following types of mass movements: rock fall, rockslide, mudflow, slump, and creep.<br>10.21. What is a glacier? What conditions are necessary for a glacier to form? Why did continental glaciers form over certain specific regions of the North American continent?<br>10.25. How do glaciers influence the surface configuration of the Earth by way of erosion and deposition?<br>10.28. How does beach drift and longshore drift move sediment along coastlines?<br>10.32. Describe some of the landforms common to environments influenced by eolian processes.<br>10.33. Describe some the important characteristics of soil.<br>10.34. What five factors are important in pedogenesis? Explain. Outline how the pedogenic processes operate. |

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| 15 | **5/06/2018** | **Topic:** The Oceans<br><br>**Watch:** Nutrients from Deep-Sea Vents<br>https://ca.pbslearningmedia.org/resource/nves.sci.earth.hydro/nutrients-from-deep-sea-vents/<br><br>**Watch:** Deep-sea mining could transform the globe<br>https://youtu.be/IYKaKeJv2dQ<br><br>**Watch:** The Next Frontier in Mining: Deep Sea Exploitation in the Pacific<br>https://youtu.be/PuEXmFQEJpw<br><br>Countries bordered by oceans often claim an exclusive economic zone that extends far out to sea. Many of these waters are disputed among various nations (e.g., the South China Sea). Fissures along plate boundaries and hotspots in the deep ocean bring minerals up from deep beneath the crust. Many islands and seamounts associated with such processes have abundant minerals in their seabed. Unknown forms of life, that we have barely begun to understand, exist in these environments as well.<br><br>**Homework 14:**<br><br>1. What is a hydrothermal vent?<br>2. Describe the process by which hydrothermal vents produce nutrient-rich water.<br>3. What did scientists see in NASA's Aqua satellite data that indicated a phytoplankton bloom?<br>**4.** What do you think could or should be done to regulate the exploitation of the seabed for minerals? Use Wikipedia to tell me about the history and possible significance of so-called exclusive economic zones (EEZs). What are their significance in this context? Should individual nations have such extensive rights? What about islands: should their nations own the rights to vast tracts of surrounding seabed much larger than the islands themselves? And what about international waters? |
| **16** | **5/13/2018** | **Topic:** The Human Dimension<br><br>**Watch:** Climate Change Formula: Rising Sea Levels + Coastal Megacities = Forced Migration<br>https://youtu.be/s4UgekcYg2o<br><br>In this video, Parag Khanna quite accurately discusses issues that will concern the entire planet, if the atmosphere warms 4 degrees C above 1990 levels. The nations of the world are mostly failing to live up to the promises made in the Paris climate treaty, and carbon levels in the atmosphere continue to ramp up at an alarming rate. In my opinion, human societies are not likely to control this trend through 'enlightened' governance alone. Unless some revolutionary process is discovered and implemented on a massive scale to sequester carbon and draw it back out of the atmosphere, and unless we preserve our remaining forests and improve agricultural practices, I believe that 4 degrees + is the most likely scenario. At the same time, the world human population is expected to rise from its current value of 7.7 billion, to over 10 billion before leveling off.<br><br>**Homework 15:**<br><br>In an essay, outline the consequences of climate change for human societies, as discussed in the video. |

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| **Final Exam** | **5/20/2019** | **Access via CANVAS (Files):** NCA4_Ch25_Southwest_Full.pdf<br>2018indicatorssummary.pdf<br><br>Additional relevant documents are available here<br><br>The Fourth National Climate Assessment:<br>https://nca2018.globalchange.gov/<br><br>California's Office of Environmental Health Hazard Assessment (OEHHA):<br>https://oehha.ca.gov/climate-change<br><br>Both the State of California and the Federal government have recently issued reports on current trends and expectations regarding climate change. The federal report is far more extensive. I've only provided the chapter on the Southwest region here for your consideration, but there are many other chapters of interest on their website.<br><br>In place of an exam, I want you to write an essay that lists and describes at least ten changes taking place in California and the Southwest region of the United States that are being triggered by global climate change, according to these reports. Do not phone this in; it should require more than three pages. |