S13716 EARTH, ITS DYNAMICS, AND THE ENVIRONMENT **HSSP at MIT**
COURSE SYLLABUS **SPRING 2020**

Instructor: H Alex Chen e-mail: S13716-teachers@esp.mit.edu
You are encouraged to contact the instructor for any issue that arises during the course or just say hello. If you are interested in a particular topic presented in class, feel free to speak to me and I would be glad to provide you more resources to read on your own!

Meeting Time: Saturdays 1:00pm--2:30pm in Room 5-234.
Find the room: http://whereis.mit.edu/ type in "5-234".

Course Description:
Provides an interdisciplinary introduction to the science of earth in connection to human activity. This course commences with an exploration of our physical planet through geological approach. Students will examine earth's landscape, formation, dynamics, and atmosphere. Together, we will use Google Earth and a number of databases to examine those physical characteristics of the earth. The second half of the course will focus on the impact of human activities on the earth. By studying pollution fate, climate change, and biogeochemical cycling, we will examine how our society impact the earth and the ways which we attempt to remediate them. We will analyze scientific principles through the lenses of modern society.

Methodology:
Each class begins with a short inquiry-based lab, activity, or case study. Lecture and discussion material will be based on the practical activity. The first five weeks will have defined topics and the last class will cover a topic based on student's interest.

Reference:
You do NOT need to obtain any of the following. However, I will be using the following resources to prepare lectures and activities. If you are interested in a specific topic, I can scan the related chapter(s) for you to read – I do not follow any specific text.

H. Alexander Chen. *The Basics of Geology*. 1st ed (2020).
H. H. Hemond and E. J. Fechner, *Chemical Fate and Transport in the Environment*, 3rd ed., Academic Press 2015.
S. Marshak and R. Rauber. *Earth Science*. 1st ed.
T. Miller and S. Spoolman. *Living in the Environment*. 19th ed. Cengage Learning.

Learning Objectives:
Upon completing this course, students will be able to:

1. Understand science is a process;
2. Observe and characterize physical characteristics of the earth and properties of earth's material;
3. Describe earth as a dynamic system of change;
4. Understand social, political, and technical complexities of solving environmental problems;
5. Apply basic quantitative techniques to describe environmental pollutions and their transport in the environment;
6. Identify tools and techniques used in the study of geology, environmental science, and environmental engineering;
7. Identify the needs in our community and our role as active members of the community.

Class Notes and Online Portal:
Class notes will be posted online in PDF (searchable). You can access this via program catalog;
Link: https://esp.mit.edu/learn/HSSP/2020_Spring/catalog
Click on the link above, which takes you to ESP 2020 Catalog. Under "Science", find the course title and you will see links to the course contents after description and prerequisite.

What can you expect from me?

- **Respect and Inclusion**: Every one of you deserve to be here and you are to be respected! I will do my best to create a safe and healthy space for intellectual discovery.
- **Preparation**: I will come prepared to teach each class whenever possible. I will also show up on time and use class time efficiently.
- **Professionalism**: I will respond to your concerns in a non-judgmental way that benefits your learning. When you are unsure about a certain concept or topic, I will answer your questions to the best of my knowledge. When I am uncertain about a topic, I will refer you to external resources.

What do I expect from you?

- **Respect and Inclusion**: I expect you to respect your peers, the room, and the instructor. Side conversations are not permitted in class, it is distracting for your peers and the instructor. Please also be respectful of your classmate's opinion and reply thoughtfully, rather than dismissively.
- **Participation**: Your participation matters! Learning is more fun when you can demonstrate what you have learned.
- **Responsibility**: Please be responsible of your own learning by efficiently use the class time, ask questions as needed. It is my hope and the goals of the program that you will continue to pursue your interest and curiosity.

Ethos and Aims of HSSP:

- Joy of Learning and Teaching
- Freedom and Independence
- Accessibility

Diversity and Inclusion:
MIT, along with many other institutions, is committed to equal opportunity, affirmative action, diversity and social justice. Please be aware of and respect the differences within or beyond our classroom.

Accommodation:
If you have reasonable physical, mental, emotional, chronic health, or learning needs that may affect you in this class, I ask you to meet with me privately to discuss reasonable adaptations or modifications I can make to the course that might be helpful for you.

Evaluation:
There is no formal assessment for this course. However, I hope you can use your time here productively and make this a learning-experience.

EARTH, ITS DYNAMICS, AND THE ENVIRONMENT
COURSE SCHEDULE
SPRING 2020 HSSP

H. Alex Chen

Week 1	**Feb. 29, 2020**
Lab	Digital Lab: Google Earth Pro and Geological Database
Topics	Introduction to Earth's History (a brief overview); Plate Tectonics (discovery and impact of the discovery); Earthquakes (causes, detections, and hazards); Intro to Mineral Composition (five major compositions)
Week 2	**March 7, 2020**
Lab	Rocks and Minerals Lab (please arrive on-time so we can start promptly)
Topics	Minerals Identification; Rock Formation; Types of Rocks; Igneous Rocks (intrusive and extrusive); Sedimentary Rocks Formation; Volcanos (types of volcanos and hazards); Metamorphic Rocks; Weathering; Rocks in New England (if time permits)
No Class on March 14th for Spark.	
Week 3	**March 21, 2020**
Lab	Atmosphere and Weather Lab (Digital)
Topics	Climate (earth's geological carbon cycle/thermostat); Climate Change from Geological and Biochemical Perspectives (ecological response to temperature and acidity change in the ocean, coral reef depletion); Geological Timescale
Week 4	**March 28, 2020**
Lab	Gulf of Mexico "Dead Zone" – a Case Study Superfund Site Cleanup – a Case Study
Topics	Pollution Transport in the Environment (types of transport); Environmental Pollution (organic and inorganic pollutants and their impact); Rivers and Lack Flow (what drives pollution transport in rivers and lacks; advection, diffusion, and dispersion); Sediment Transport (sediment deposition and concentration)
Week 5	**April 4, 2020**
Lab	Love Canal – a Case Study
Topics	First Half: Pollution Transport in the Sediments and Subsurface Second Half: Air/Water Exchange (equilibrium, intro to environmental chemistry); Atmospheric Pollution (pollution in the atmosphere and ozone depletion; air pollution and the Clean Air Act);
Week 6	**April 11, 2020**
Lab	Selected Case Studies Based on Topic of Student's Choice
Topics	First Half: Climate Change A list of Special Topics will be announced in-class in Week 4.

(last revision: 24 February 2020)