# DISASTER SCIENCE:

## UNDERSTANDING HAZARDS AND DISASTERS

PLAN 671 ERTH 604: COURSE SYLLABUS

FALL 2020

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POST 703

MONDAYS, 5 – 8 PM

### COURSE DESCRIPTION

*Disaster Science* will be taught in a seminar format consisting of learning environments in both the field and the classroom. A weekend field excursion to the Big Island of Hawai'i is voluntary, and will provide first-hand familiarity with several of the hazards to be discussed in the class. Classes will include a combination of lectures by the instructor, guests, and case studies presented by the students. Lectures are split into two sections: one addresses the physical science of the natural event (and how it happens) while the other concentrates on the social impacts and human responses to natural hazard events using case studies. Seminars provide the foundation for which students will prepare their assignments and presentations. The course has key readings that should be reviewed by the student, as well as many optional ones that provide a more complete understanding of disasters presented in the case studies.

## COURSE DESCRIPTION

**INTRODUCTION:** We will discuss how to define a disaster, as well as the frequency and intensity of disasters. This lecture will set up the course framework and make some brief comparisons between many types of disasters of recent years. We will discuss how to understand 1) physical processes of hazards, 2) scales of hazard impact (dependent on hazard intensity and types of communities affected), and 3) societal reactions to the events (social, political, and economical). Four types of events will be singled out for case studies of disasters.

- What is a disaster (1 hour)
- Risk and resilience (1 hour)

**VOLCANIC CRISIS MODULE:** Volcanic eruptions are unique among hazards faced by societies due to 1) the long-lived nature of an event, 2) multiple hazards can be spawned by one event, 3) haz3) hazards can have widespread impact, and 4) warning signs are typically present for days to months, causing fatigue and denial. This module is closely focused on the 2018 Kīlauea eruption.

- Volcano crisis case studies (2 hours)
- 2018: chain of consequences scenarios (2 hours)
- ? Big Island excursion (16 hours)

**EXTREME WEATHER MODULE:** Hurricanes are regional events that last for hours to days, and provide days to a week of warning time. There is typically time to prepare for a hurricane or evacuate from a predicted area to be adversely affected, provided that communities have the means to do so. In the first section of this module, we will discuss how hurricanes are classified, why/how/where they form, factors contributing to their intensity, and the hazards posed by them. In the second section of this module, we will consider the social, political, and infrastructural impacts of Hurricane Katrina (2005, USA), and in less detail, the three 2017 hurricane disasters and compare these events to other smaller intense weather systems.

- Fundamentals of extreme weather (1 hours)
- Katrina case study (1 hour)
- 2017 case study (1 hour)
- Tornado and storm case studies (1 hours)

**EARTHQUAKES MODULE:** Earthquakes are short-lived, regional events with little to no warning time. Earthquakes rarely kill people is, rather, it is infrastructural damage caused by the earthquake that kills people. We will discuss how earthquakes are classified, where they typically occur, and how scientists measure them), factors leading to the intensity of shaking felt by communities, and why this ground motion causes damage to infrastructure. We will consider economic and human costs of earthquakes, social and political responses, and how preparation/community resilience can dramatically alter the recovery time for an earthquake. The focus will be on a case study of Kobe 1991, with comparison to the Haiti earthquake of 2010.

- Physical nature and impacts of earthquakes (1 hours)
- Social nature of earthquake disasters (1 hour)
- Kobe 1995 case study
- Haiti 2010 case study

**TSUNAMI MODULE:** Large tsunamis are of international extent, accompanied by great earthquakes, and provide up to several hours of warning time. In the first section of this module, we will discuss what a tsunami is, how ocean-wide damaging tsunamis are generated, how we measure them both on land and in the ocean basin, what damage they can cause, why the same tsunami may behave differently at different coastlines, and classic warning signs that a tsunami is imminent. In the second section of this module, we will analyze and reflect on the first-ever recorded Indian Ocean tsunami (2004, Indonesia) and its international social, political, and economic impacts. We will also discuss the recent Tohoku tsunami (2011, Japan).

- Physical nature of tsunamis (1 hour)
- Impacts of tsunamis (1 hour)
- Indian ocean case study (1 hour)
- Tohoku case study (1 hour)

**STUDENT PRESENTATIONS:** Order of presentations is TBA. Students will pick their own disaster and give a 15 minute presentation to the class on what the hazard was, and why the result was a disaster. Any event (world-wide) is eligible, but duplicates in the class are not allowed. Sign up for your event as soon as you are decided on it.

## COURSE EVALUATION

| ACTIVITY | WEIGHT | GRADE |
|---|---|---|
| Big Island Assignments | 30% | >90% = A |
| Hurricanes Paper | 30% | >80% = B |
| Mini Case Study | 40% | >70% = C |

There will be no extra credit and no curving of final marks.

**Because assessment is based entirely on these assignments you MUST be sure to complete all THREE assignments in timely fashion. You will not attain a passing grade any other way.**

## KEY REFERENCES

General reading

- Keller, E.A., DeVecchio, D. E., 2016. *Natural Hazards: Earth's processes as hazards, disasters, and catastrophes* (4rd Edition) Prentice Hall. 574 pp.
- Mileti, D.S., 1999. *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Joseph Henry Press. Washington D.C. 351pp.

- Introductory class
  - Centre for Research on the Epidemiology of Disasters (2015). The human cost of natural disasters: a global perspective. 57 pp.
  - Pelling, M., 2005. Natural disasters? In *Social Nature: Theory, practice and politics*. Castree, N., Braun, B., (eds). Blackwell, pp. 170-188.

- Volcano Module
  - Heliker, C., Stauffer, P.H. and Hendley, J.W. 1997. Living on Active Volcanoes—The Island of Hawai'i. *U.S. Geological Survey Fact Sheet* 073-97, 4 p
  - Kauahikaua. J, 2007, Lava Flow Hazard Assessment, as of August 2007, for Kīlauea East Rift Zone Eruptions, Hawai'i Island, *U.S. Geological Survey Open-File Report* 2007-1264, 12 p.
  - C. A. Neal, et al,. 2018. Kīlauea Volcano's 2018 flank eruption and summit collapse. *Science*: 363, 367-374. 10.1126/science.aav7046..
  - Sutton, J., Elias, T., Hendley J.W., and Stauffer, P.H. 2000. Volcanic Air Pollution—A Hazard in Hawai`i. *U.S. Geological Survey Fact Sheet* 169-97, 4

- Extreme Weather Module
  - Katrina
    - ✓ Abramson, D.M., Stehling-Ariza, T., Park, Y.S., Walsh, L., Culp, D., 2010. Measuring Individual Disaster Recovery: A Socioecological Framework. In: *Disaster Medicine and Public Health Preparedness* 4(1): S46-S54.
    - ✓ Eisenman, D.P., Cordasco, K.M., Asch, S., Golden, J.F., Glik, D. (2007). Disaster planning and risk communication with vulnerable communities: Lessons from Hurricane Katrina. American Journal of Public Health, 97: 109-115.
    - ✓ Robertson, D.O., 2008. Property and Security, Political Chameleons, and Dysfunctional Regime: A New Orleans Story. In: *Seeking Higher Ground: The Hurricane Katrina Crisis, Race, and Public Policy Reader,* (eds) Marable, M., Clarke, K., New York: Palgrave Macmillan. pp. 39-63

- Earthquake Module
  - Kobe, Japan
    - ✓ Tierney, Goltz, 1997. Emergency Response: Lessons Learned from the Kobe Earthquake, University of Delaware Disaster Research Center.
    - ✓ Somerville, P., 1995, Kobe Earthquake: an urban disaster. EOS, American geophysical union, 76, 49-51 (cross ref: Current Science, vol 68, iss 12, 1205-1208)
    - ✓ Katayama, T., 2004. Earthquake disaster risk mitigation before and after the 1995 Kobe earthquake. 13th world conference on earthquake engineering, #5005

- Tsunami Module
  - Tohoku, Pacific Ocean
    - ✓ Imamura, Anawat, 2012. Damage due to the 2011 Tohoku earthquake tsunami and its lessons for future mitigation. Proceedings of the international symposium on engineering lessons learned from the 2011 great east Japan earthquake, March 1-4, 2012, Tokyo, Japan.
    - ✓ Normile, D., 2012. One year after the devastation, Tohoku designs its renewal. Science, 335, pp. 1164-1166
    - ✓ Bird, W.A., Grossman, E., 2011. Chemical Aftermath: Contamination and Cleanup Following the Tohoku Earthquake and Tsunami Environ Health Perspect. July; 119, 7, pp. a290–a301. doi: 10.1289/ehp.119-a290
  - Indonesian, Indian Ocean
    - ✓ Athukorala, Resosudarmo, 2005. The Indian Ocean Tsunami: Economic Impact, Disaster management, and Lessons. Asian Economic Papers.
    - ✓ Rodriguez, Wachtendorf, Kendra, Trainor, 2006. A snapshot of the 2004 Indian Ocean tsunami: societal impacts and consequences. Disaster Prevention and Management, 15, 1, pp. 163-177.

The University of Hawai'i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you. Staff can also direct you to resources that are in the community.

**As members of the University faculty, your instructors are required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator**. Although the Title IX Coordinator and your instructors cannot guarantee confidentiality, you will still have options about how your case will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.

If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, use the **confidential resources available here**:

http://www.manoa.hawaii.edu/titleix/resources.html#confidential

If you wish to directly REPORT an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence or stalking as well as receive information and support, contact: Dee Uwono Title IX Coordinator (808) 956-2299 t9uhm@hawaii.edu.

Disability Access: If you have a disability and related access needs the Department will make every effort to assist and support you. For confidential services students are encouraged to contact the Office for Students with Disabilities (known as “Kokua”) located on the ground floor (Room 013) of the Queen Lili'uokalani Center for Student Services:

KOKUA Program; 2600 Campus Road; Honolulu, Hawaii 96822 Voice: 956-7511; Email: kokua@hawaii.edu; URL: http://www.hawaii.edu/kokua