

## Natural Hazards and Disasters

**Courses:** OEAS 250N (CRN 17463); class three credits; and OEAS 250N (CRN 17470), lab 1 credit

**Course title:** Natural Hazards and Disasters

**Instructor:** Dr. Hans-Peter Plag

**Term:** Fall 2018, August 27 – December 14, 2018

**Time:** Tuesdays, 4:20 PM - 8:00 PM

**Location:** SRC 1000

**Office Hours:** On request.

## Course description

This course and the lab introduce some of Earth's natural phenomena that can, and often do, result in major loss of life or catastrophic damage to property. These phenomena are considered in their relevance to major national and international efforts to manage and reduce disaster risk and increase societal sustainability. Students in the course develop and enhance their research, analysis, critical thinking, and writing skills. The course is suitable for first and second year undergraduate students considering a career in science, teaching, and governance, or who are just interested to know more about the planet on which they live.

## Learning Goals

Students will acquire the skills to understand natural hazards and the potential disasters that may be triggered by these phenomena. They will:

- Have an understanding of the basics of a variety of environmental phenomena that can cause major disruptions to human and non-human populations, the Earth's life-support system, and, in the case of human communities, cities and infrastructure.
- Be able to distinguish between the hazards and the processes that can lead to disasters in the human and non-human environment.
- Have knowledge of the basic concepts of hazards, vulnerabilities, disasters, risk and disaster risk governance.
- Have an understanding of human perception of risk as a social construct and appreciate the importance of human impacts on the magnitude and frequency of hazardous events.
- Be able to research the relevant data, describe the phenomena based on evidence, understand the uncertainties inherent in complex systems, critique discussions of hazards and disasters that are presented in the media, and to express the result of this research in a scientific case study report.
- Have an appreciation of the major national and international programs aiming at disaster risk governance also in the context of sustainable development.

## Requirements

There are no prerequisite courses, but you are expected to have reached the Commonwealth of Virginia standards-of-learning in high school math, science, and writing. Regular class attendance is required.

## Course Contents

Humanity is embedded in, and interacts with, the Earth's life-support system (ELSS). The ELSS provides the basis for the welfare of all human and non-human communities, and these communities are adapted to prevailing conditions. Hazardous events can change these conditions and cause damage to the communities, with the impacts ranging from local, individual to global scales. For humans, reducing disasters caused by hazards is a goal and a necessity to improve sustainability of human communities. Disaster reduction, or better, Disaster Risk Governance (DRG), requires a thorough understanding of the hazards that can occur, the probability of them occurring, and the processes that can lead to disastrous impacts on human and non-human communities.

Although the class is titled "Natural hazards and disasters," it needs to be emphasized that the distinction between natural and anthropogenic hazards is somewhat arbitrary. It would work if humans were in a spaceship and Earth was free of humans. The fact that humanity is an integral part of the ELSS and is modifying the ELSS at a very significant level leads to many hazards that seem to be "natural" but are actually to some extent caused or amplified by humans.

In the class, we define a hazard as a change of the system state that can lead to a reduction of the system's capability to function. A hazard can be a short event (e.g., an earthquake), a longer process (e.g., extinction), or a slow trend (e.g., sea level rise). We distinguish:

- extraterrestrial hazards: asteroids, bolides, radiation events, and solar storms
- geo(logical) hazards: those that arise mainly from processes in the solid earth;
- hydro-meteorological hazards: those that are associated with processes in the coupled hydrosphere-atmosphere system;
- biological hazards: pandemics, rodents, insects, algae-bloom, extinction;
- chemical hazards: changes in major flows of the ELSS leading to changes in the composition of atmosphere, ocean, soil, water (including pollution, acid rain, ocean acidification, change of greenhouse gases);
- technological hazards: accidents, mal-function, AI, nano-technology;
- social hazards: involuntary migration, unrest, racism, genocide, wars, imperialism, failed governance
- economic hazards: depressions, bubbles, speculations, peak-oil, etc.

The class will introduce these hazards and discuss their direct and indirect relevance for human and non-human communities. A useful concept for assessing the relevance is "Risk", which utilizes the "Probability Density Function" (PDF) of the hazard. Main focus will be on hazards with pre-dominantly non-human origin.

The boundary between hazards of non-human and human origin is blurred. Technological hazards can be triggered by non-technological hazards. Human activity can trigger hazards or change the spectrum of hazards in terms of frequency and magnitude. Human activity can also lead to the ELSS crossing thresholds and entering new states with significantly different characteristics and mal-adaptation. The interdependency of human and non-human hazards will be discussed in detail.

Hazards and disasters are linked by processes in the exposed community and its environment that are triggered by a hazardous event. These processes depend on how the community is organized and

developed, and the same hazardous event can lead to a wide range of disasters depending on the exposed community's preparedness and adaptation. Understanding the processes that link hazards and disasters is a prerequisite for DRG. The class will analyze these processes based on case studies.

In the interaction with the ELSS, humans have to make choices about where to settle, how to develop communities and the built environment, how to meet the needs of human communities, and how to prepare for hazardous events. Many of these choices benefit from a risk-based decision-making. For many of the non-human hazards, we cannot change very much the PDF of the hazard, but we can impact vulnerability and exposure of human communities. The concept of DRG captures this. Risk associated with a specific hazard is defined as the product of hazard probability, vulnerability and value of the assets exposed to the hazard. The class will introduce the concept of DRG and apply to case studies.

Disaster risk assessments are an important tool to guide community actions to reduce or govern the risk. However, public and governmental support for DRG depends on risk awareness, which is determined by individual, community, country and cultural biases. In modern societies, the media play an important role for the development of, as well as the biases in, risk awareness. The class will review a number of risk assessments and relate them to risk awareness. The role of the media in shaping risk awareness will be analyzed.

## Work Skills and Collaboration

You must be able to access Blackboard and the class web page at [http://www.mari-odu.org/academics/2018f\\_disasters](http://www.mari-odu.org/academics/2018f_disasters) on a daily basis. Assignment details, course materials, schedule changes, and other important information will be posted at the class web page regularly. Please visit the course website for detailed weekly course information.

Exam schedules and points received for assignments and exams will be available on the class page on Blackboard.

For some of the lab exercises, basic knowledge of Excel or a similar software will be necessary. If you have no such knowledge, you will still be able to carry out the exercises if you collaborate with a student who has the knowledge. For some exercises, it will be easier to use a tool like powerpoint or a graphical software. For the study case papers, you will need to use a text processing software such as Word or a similar program.

From time to time you will be asked to research and bring specific content (e.g., published facts, evidence, sources) to the class. Do not assume that this content will be provided to you if you fail to complete the assignment.

Collaboration is expressly permitted, encouraged, and may even be required for team projects, but must follow these guidelines:

- You must actively participate in the collaborative project;
- You must write your own individual report on any team project work;
- All team members' names must be included in any written project work;
- You must understand the material and be able to answer questions on it.

## Reading Material

Access to a digital text will be supplied to students at no cost. All necessary information for the course, including the reading list and homework are posted here: [http://www.marion.edu.org/academics/2018f\\_disasters](http://www.marion.edu.org/academics/2018f_disasters). Students must bring a laptop, mobile phone, tablet, or other device for internet access to every class.

*You are responsible for reading and complying with all information posted.*

## Grading

The course combines lectures with lab exercises and project work. There are weekly reading assignments, which correspond to the class contents and the lab exercises. In the lab, 10 sets of questions will be discussed and written answers to the questions are due after the lab. Three case study papers will be required and there will be a midterm and final exam.

The class and lab will be graded with one grade for CNR 17463. The course will be graded on an A to F scale. You will be graded on a standard scale:

100.0-93.0% = A; 92.9-90.0% = A-  
89.9-87.0% = B+; 86.9-83.0% = B; 82.9-80.0% = B-  
79.9-77.0% = C+; 76.9-73.0% = C; 72.9-70.0% = C-  
69.9-67.0% = D+; 66.9-63.0% = D; 62.9-60.0% = D-  
0-59.9% = F.

The overall grad for the class and lab will be composed of individual grades using:

Class and lab participation 5%  
Written Case Study reports (3 of them) 45%  
Question sets (10 of them) 25%  
Mid term exam 10%  
Final exam 15%.

**University regulations prohibit communicating test results via email or by phone. If you wish to talk about your grade, please make an appointment. All scores will be placed on BlackBoard as soon as possible after they are graded.**

## Grade forgiveness policy:

Missed question sets or exams may only be made up for valid reasons such as: participation in ODU sports team events (a coach's note is needed), evidence of illness (doctor's or Student Health Services' note needed), bereavement of an immediate family member (death notice needed), or documented court appearance (copy of notice to appear needed). Advance notice in writing must be given whenever possible.

Late assignments or reports will be graded on a reduced point scale as follows:

up to 24 hrs late = 90%  
up to 48 hrs late = 80%

A further 10% per day reduction in possible points earned will be applied, up to a maximum total of 5 days late, after which the assignment will not be accepted without evidence that the student was sick or there was a family emergency.

## Course Disclaimer

Every attempt is made to provide a syllabus that is complete and that provides an accurate overview of the course. However, circumstances and events may make it necessary for the instructor to modify the syllabus during the semester. This may depend, in part, on the progress, needs, and experiences of the students.

## Teaching Philosophy

The material covered in this course is exciting and can also be challenging. I encourage you to ask questions in class if you are uncertain about concepts, ideas or formulas. I recommend that you read the reading material weekly, prior to the lecture and study your own lecture notes frequently. The material that I cover in this class will build upon itself, and reading through course notes regularly will allow you to catch problems early, if you find that you are having them.

## Honor Code

By taking this course, you agree to adhere to Old Dominion University's honor code. Cheating on exams, quizzes, plagiarism in written work, and failing to participate fully in group work will not be tolerated; infractions will be dealt with according to University policy. General honor code guidelines for various course assignments are posted in the on Blackboard (Policies > General Policies); all students are responsible for reading, understanding, and following those guidelines.

All students should follow the principles of the ODU Honor Code: <https://www.odu.edu/about/monarchcitizenship>

**Honor Code:** *We, the students of Old Dominion University, aspire to be honest and forthright in our academic endeavors. Therefore, we will practice honesty and integrity and be guided by the tenets of the Monarch Creed. We will meet the challenges to be beyond reproach in our actions and our words. We will conduct ourselves in a manner that commands the dignity and respect that we also give to others.*

## Academic Integrity

Old Dominion University is committed to students' personal and academic success. In order to achieve this vision, students, faculty, and staff work together to create an environment that provides the best opportunity for academic inquiry and learning. All students must be honest and forthright in their academic studies. Your work in this course and classroom behavior must align with the expectations outlined in the Code of Student Conduct, which can be found at <http://www.odu.edu/oscai>. The following behaviors along with classroom disruptions violate this policy, corrupt the educational process, and will not be tolerated:

- Cheating: Using unauthorized assistance, materials, study aids, or other information in any academic exercise.
- Plagiarism: Using someone else's language, ideas, or other original material without acknowledging its source in any academic exercise.

- Fabrication: Inventing, altering or falsifying any data, citation or information in any academic exercise.
- Facilitation: Helping another student commit, or attempt to commit, any Academic Integrity violation, or failure to report suspected Academic Integrity violations to a faculty member.

## **Requirements of the COS Department of Ocean, Earth and Atmospheric Sciences**

By taking this course, you agree to adhere to the requirements and policies of the ODU Department of Ocean, Earth and Atmospheric Sciences; these may be found on Blackboard (Policies > General Policies).

### **If you are Experiencing Difficulty**

If you are having any difficulty – with specific course content or anything else we can help with – please do not hesitate to ask for help. Please come and talk to me in person as soon as the problem arises. Remember also that you have access to a variety of student services on campus.

### **If you have any Special Needs**

Please inform me as soon as possible of any special needs you might have, including medical conditions that may require special accommodation.

### **Accommodation Statement**

Students are encouraged to self-disclose disabilities that have been verified by the Office of Educational Accessibility by providing Accommodation Letters to their instructors early in the semester in order to start receiving accommodations. Accommodations will not be made until the Accommodation Letters are provided to instructors each semester. .

### **Withdrawal**

A syllabus constitutes a contract between the student and the course instructor. Participation in this course indicates your acceptance of its schedule, requirements, and policies. Please review the syllabus and the course requirements as soon as possible. If you believe that the nature of this course does not meet your interests, needs or expectations, if you are not prepared for the amount of work involved or if you anticipate that the class meetings, assignment deadlines or abiding by the course policies will constitute an unacceptable hardship for you, you should drop the class by the drop/add deadline, which is located in the ODU Schedule of Classes.

### **Managing Conflicts**

If you are having a conflict with another student in your class, please let me know right away. Any issues we cannot resolve among ourselves will be taken to the OEAS Department Chair, Dr. Fred Dobbs, for mediation.

