UNIVERSITÀ
DI TORINO

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Visiting Professor Program
Academic Year 2024/2025

TEACHING COMMITMENT: **12 hours**

COURSE TITLE
Seismic and Volcanic Risk

TEACHING PERIOD
1st term

SCIENTIFIC AREA
Geochemistry and Volcanology

LANGUAGE USED TO TEACH
English

COURSE SUMMARY
The course provides adequate preparation in the scientific and technical/professional fields related to the study of seismic and volcanic risk and explores mitigation strategies for minimizes these risks. The first part of the course will introduce the student to the application of the "anti-seismic" legislation and to the use of a data analysis methodology (historical and site) to get to the drafting of seismic microzonation maps.
The second part of the course addresses volcanic risk, including: the specific hazards posed by volcanic events; assessment of eruption magnitude and intensity, understanding the impact of specific events (i.e. areas of inundation), creating hazard maps, assessing risk, and exploring mitigation strategies that are effective, as well as, feasible. The problems of mitigation of volcanic risk relating to the regions of Italy, Europe, North America and other volcanic areas will be studied.
The course will be divided into 5 parts: 1) Review of Volcanic Eruption Principles, 2) Review of Volcanic Hazards and Volcanic Hazard Precursors, 3) Forensic volcanology applied to Volcanic Risk,

4) Models for simulating areal impact of volcanic events, 5) Risk, Volcanic Risk, Risk Mitigation. The lectures are supplemented with lab, tutorial and field based exercises.

LEARNING OBJECTIVES

This course provides students with the knowledge, understanding and real-world skills relevant to assessing risk related to seismicity and volcanism across the planet. They are required to know the main methods for studying volcanic events. The students must also understand the physical basis behind these events and the nature of the hazards that result. The students will know how to quantitatively evaluate the magnitudes of volcanic eruptions and then make risk assessments. They must also become competent in using forensic studies of (pre-) historic events to refine recurrence intervals for specific types/magnitudes of seismic or volcanic events.

The individual students will be able to: i) understand the connections between the styles/modes of volcanic eruption, the nature of the hazard, and the potential areas of impact. ii) find and use (pre-)historic datasets to calculate recurrence intervals. iii) quantify volcanic risk with probabilistic evaluation of return periods of processes.

The lectures are designed to transform lecture material into real-world skills sets.

Exercise (EX) 1: Students will learn to use the web-based software VOGRIPA to find volcanoes that have erupted in specific ways or specific intensity. These data are used to compute eruption recurrence intervals. EX2: Students will review a professional volcanic hazards map to i) document the hazards; ii) describe the impact zone of each; and iii) evaluate how VEI is accounted for. Students will create a new hazard map using data they "mine" from web-based software (e.g. VOGRIPA). EX3: Students will use VOGRIPA to compute recurrence intervals for a volcano. They will make recommendations on what additional work needs to be done to improve the estimated recurrence interval(s). EX4: Students will software to simulate events associated with volcanic eruptions (e.g., ash fall out, lava, lahars). They will evaluate the input parameters, the assumptions & countour conditions.

OTHER ACTIVITIES BESIDES THE COURSE

Students will eventually tour the experimental rheology laboratory in the Earth Sciences Department at the University of Torino where they will be shown how the physical properties (i.e. viscosity) of natural melts and magmas are measured. These properties control the nature of volcanic eruptions and the hazards they present (presented during the course).

Students will have field trip to a volcanological observatory (INGV, Bologna?) or, in alternative, a cycle of seminars with experts in the field of volcano monitoring. There the students be exposed to the "cutting-edge" scientific computational models for forecasting the effects of volcanic eruptions.

At the end of the course, students will make short oral presentations of their volcanic risk assessments and mitigation strategies for a single volcano. The presentations will be 10-15 minutes and followed by questioning by their peers and the teaching faculty.

VISITING PROFESSOR PROFILE

The candidate should have strong interest in volcanology and geochemistry as it relates to the formation, transport and eruption with allied skills in modelling of geological datasets. The ideal candidate experience of support for the course should be on : i) teaching Volcanology at both grad and undergrad course; with particular emphasis on Volcanoes producing effusive to explosive

volcanic eruptions in Italy and other effusive or explosive volcanic contexts; ii) experience in experimental volcanology; iii) the investigation of the role of physical properties in eruption dynamics; iv) developing and applying of magma transport models to eruption and emplacement dynamics ; iii) skills on mathlab coding as well on Q-GIS based software would also be relevant.

CONTACT REFERENT

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