University of Pavia IUSS School of Advanced Studies

Civil Engineering for Mitigation of Risk from Natural Hazards

SEISMIC HAZARD AND ENGINEERING SEISMOLOGY

Institutions:	University of Pavia and IUSS Pavia
Curriculum:	ROSE
Term:	Academic Year 2024/2025 – 2nd Semester
Credits (CFU):	6
Instructor:	Prof. Valerio Poggi (vpoggi@ogs.it)
Teaching assistant:	DU FANGQING (fangqing.du@iusspavia.it)
Class duration:	March 3rd – March 28th, 2025 (36 hours of classes + 15 hours of lab/tutoring)
Classroom:	xxx

Goals and course structure

The course aims at providing the students with the essential knowledge and skills to face most common seismology problems in engineering and applied geophysical practice. The course splits into two main blocks. In the first module, topics of engineering interest are discussed, such as intensity measures, ground motion prediction equations, earthquake occurrence analysis, seismotectonics, seismic hazard assessment (deterministic and probabilistic); in the second module hints of theoretical seismology are provided, with a focus on wave propagation and source representation issues.

Practicum

The course is complemented by laboratory in-class activity, a number of selected readings and homework assignments, with a focus on the use of the computer to solve simple problems of seismological interest.

Prerequisites

Advanced calculus and linear algebra are useful, although not a requirement for the course. The course lab will make use of Python language for some exercises, therefore some familiarity with computer programming is recommended.

Qualification

The course is concluded by both a practical exercise and a written exam. The practical part consists in the discussion of a personal project developed during the laboratory hours of the course. The student is expected to present his elaboration to the class and to the examiner by means of a brief slide show (10min. plus some time for questions). The written exam consists of a test with multiple questions about specific topics, freely excerpt from the course program.

Grading

ACTIVITIES	PERCENTAGE
Class participation	10%
Project presentation	20%
Final Exam	70%

Reference textbooks

- Stein S., and M. Wysession. An Introduction to Seismology, Earthquakes, and Earth Structure. 1st ed. Malden, MA: Blackwell, September 2002. ISBN 9780865420786.
- Kramer, S.L., Geotechnical Earthquake Engineering, Prentice Hall, 1996, ISBN 0133749436
- Lecture notes, scientific articles and tutorials will be provided throughout the course

Note
The instructor reserves the right to make changes to this syllabus as necessary.

Course schedule

Week	Date	Lecture hours From__ To__	Tutorial hours From__ To___	Subject	Tot h
	03/03	09.30-12.30	--	Course Introduction; Earthquakes and faults	3
	04/03	09.30-12.30	--	Seismotectonics; Ground motion measurements	3
1	05/03	09.30-12.30	--	Earthquake size: intensity and magnitude	3
	06/03	09.30-12.30	--	Seismic catalogues; Seismic occurrence analysis	3
	07/03	--	09.30-12.30	PSHA modelling laboratory	3
	10/03	09.30-12.30	--	Ground motion prediction Equations	3
	11/03	--	--	DSHA and PSHA	3
2	12/03	--	09.30-12.30	PSHA modelling laboratory	3
	13/03	--	09.30-12.30	PSHA modelling laboratory	3
	14/03	--	--	--	--
	17/03	09.30-12.30	--	Wave types and seismograms	3
	18/03	09.30-12.30	--	Seismic source representation	3
3	19/03	09.30-12.30	--	Wave propagation in heterogenous earth	3
	20/03	09.30-12.30	--	Earthquake location and Inverse problems	3
	21/03	--	09.30-12.30	Exercises – Revision / Questions	3
	24/03	09.30-12.30	--	Seismometers and seismic networks	3
	25/03	09.30-12.30	--	Ambient vibration seismology	3
4	26/03	--	09.30-12.30	Exercises – Revision / Questions	3
	27/03	09.30-12.30	--	**Exam**	3
	28/03	---	--	---	--

* Additional tutorial and revision hours will be agreed with students during the course.