



Civil Engineering for Mitigation of Risk from Natural Hazards

Course: Seismic Risk Assessment

a.y.: 2024-2025

Lecturers: Prof. Paolo Bazzurro, Prof. Dimitrios Vamvatsikos, Dr. Mohsen Kohrangi

Teaching Assistant: Alessandro Damiani

Date: 24/09/2025 - 20/10/2025

Classrooms at Broletto (Piazza della Vittoria 15): See timetable below for more details

Course schedule

	<u> </u>	Risk Assessr	nent and	FO22 E211M	ativil			
				WEEK 1				
		22-Sep	23-Sep	24-Sep	25-Sep	26-Sep		
		Monday	Tuesday	Wednesday	Thursday	Friday		
	Lectures			4	4	3	TOT Lectures	11
				09:00-13:00	09:00-13:00	09:00-12:00		
				aula 1-15	aula 1-15	aula 1-15		
					2	2	Tot Tutorials	4
	Tutorials				14:30-16:30	14:30-16:30		
					aula 1-15	aula 1-15		
							TOT week 1	15
РВ				WEEK 2				
		29-Sep	30-Sep	01-Oct	02-Oct	03-Oct		
		Monday	Tuesday	Wednesday	Thursday	Friday		
	Lectures	3	3	3	3	3	TOT Lectures	15
		09:00-12:00	09:00-12:00	09:00-12:00	09:00-12:00	09:00-12:00		
		aula 1-15	aula 1-15	aula 1-15	aula 1-15	aula 1-15		
	Tutorials	44.4		uu.u 2 25	""	4414 2 25	Tot Tutorials	0
	Tatomas						Tot Tatoriais	
							TOT week 3	15
							TOT week 2	15
				NAME OF THE OWNER OWNER OF THE OWNER				
				WEEK 3				
		06-Oct	07-Oct	08-Oct	09-Oct	10-Oct		
		Monday	Tuesday	Wednesday	Thursday	Friday		
		4	4	4	4	2	TOT Lectures	18
	Lectures	10:30-12:30	10:30-12:30	10:30-12:30	10:30-12:30	10:30-12:30		
		14:00-16:00	14:00-16:00	14:00-16:00	14:00-16:00			
MK		aula 1-15	aula 1-15	aula 1-15	aula 1-15	aula 1-15		
		2	2	2	2		Tot Tutorials	8
	Tutorials	16:00-18:00	16:00-18:00	16:00-18:00	16:00-18:00			
		aula 1-15	aula 1-15	aula 1-15	aula 1-15			
						single bldg exam		
						14:00-16:00		
						2	TOT exams	2
						aula 1-15	TOT week 3	26
				WEEK 4		uuiu 1-13		20
		13-Oct	14-Oct	15-Oct	16-Oct	17-Oct		
		Monday	Tuesday	Wednesday	Thursday			
		Monday 4			inursday	Friday	TOT I astures	8
	Lastrona		10.00.13.00	10.00.13.00			TOT Lectures	8
	Lectures	10:00-12:00	10:00-12:00	10:00-12:00				
		13:30-15:30						
		aula 1-15	aula 1-15	aula 1-15				
			2	2			Tot Tutorials	4
	Tutorials		13:30-15:30	13:30-15:30				
						Final exam risk		
						assessment -		
			aula 1-15	aula 1-15		general material		
						9:00-11:00	Tot Exams	
	EXAMS					2		2
						sala del camino		
							TOT week 3	12
				WEEK 5				
		20-Oct	21-Oct	22-Oct	23-Oct	24-Oct		
				Wednesday				
	Lastuma	Monday	Tuesday	vveunesaay	Thursday	Friday	TOT Leastures	_
	Lectures	Distance of the					TOT Lectures	0
		Bldg portfolio exam						
	Tutorials	9:00-12:00					Tot Tutorials	0
		3						
		aula 1-15						
	Final Exam						TOT exams	3
							TOT Lectures	52
	İ						TOT tutorials	16
							Tot Exam	5
							Grand TOT	73

Overview of the course

This course comprises three distinct but well-connected parts. The main focus of the course is on seismic risk but it will also deal with risk assessment for other perils.

This course will start with a very succinct overview of the basics of probability and statistics that are commonly used in the field of hazard and risk assessment. The knowledge of the subject is a pre-requisite of the course. After this preamble, in the first part (weeks 1 and 2) we will move on to describe the basics of risk assessment and loss estimation for assets subject to natural events such as earthquakes and tropical cyclones. In this part we will also review the fundamentals of seismic hazard analysis and we will cover both probabilistic and deterministic approaches. Then we will deal with the theory behind catastrophe risk modeling of portfolios of structures mostly for earthquakes but will briefly discuss tropical cyclones as well. The applications discussed are typical of those found in the insurance/reinsurance industry, capital markets, and sovereign disaster risk financing. Therefore, some fundamentals of insurance/reinsurance will also be provided. Then we will introduce the concepts of seismic risk for single structures and we will compare and contrast them with the approach for portfolio of assets. Time permitting, we will discuss the risk assessment of networks and of nuclear power plants. These cases have special aspects that are not found in the previous applications discussed during the course.

The <u>second part</u> of the course (<u>week 3</u>) will tackle in detail the state-of-the art approach to assess seismic risk of single buildings for both collapse and loss estimation purposes. The techniques that you will learn here are applicable both to the design of new buildings and to the assessment of existing ones.

Finally the <u>third and last part</u> (<u>week 4</u>) will focus on the application of the portfolio seismic risk assessment theory to real case studies. In this part you will be using models already built and the emphasis will be in learning how to compute and interpret correctly their results.