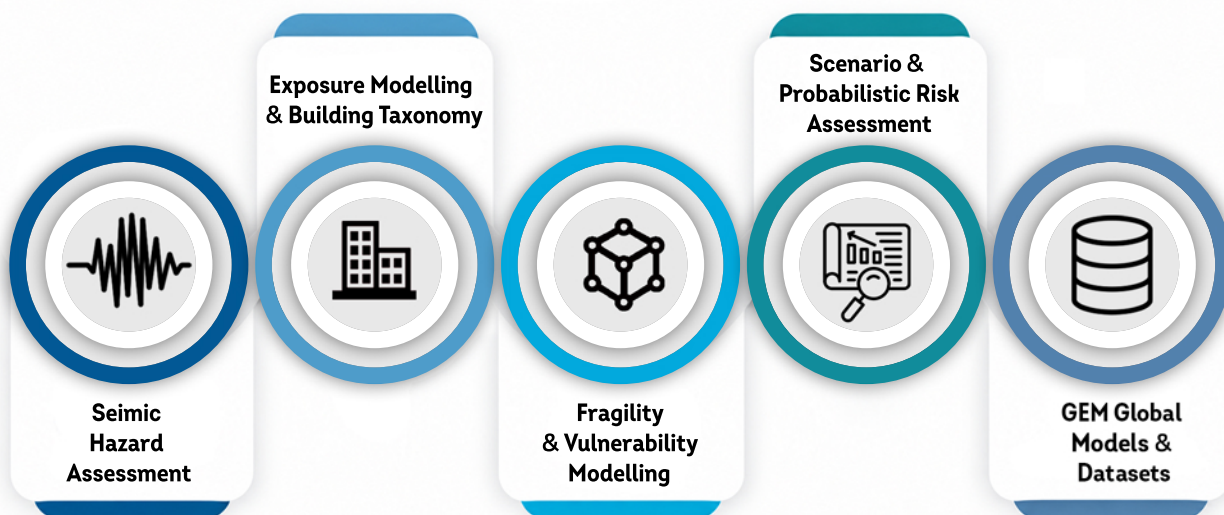


GEM MODELS AND OPENQUAKE ENGINE TRAINING

3rd - 12th February 2027 | In person at EUCENTRE Foundation, Pavia, Italy

This course, part of the Doctoral Programme in Earthquake Engineering at IUSS Pavia, is organised by the Global Earthquake Model (GEM) Foundation, and aims to provide a comprehensive overview of state-of-the-art methods and models for seismic hazard, exposure, vulnerability and risk assessment, and their implementation within the OpenQuake Engine under a number of different use cases. The course will include both theoretical lectures and training sessions on how to use the OpenQuake Engine, from basic scenario analysis to advanced modelling of probabilistic seismic hazard and risk.

KEY TOPICS



LECTURES/TUTORIALS/ASSIGNMENT

3rd - 12th February 2027

In person at EUCENTRE Foundation, Pavia, Italy.

The tutorial exercises and a course assignment will be undertaken in predefined groups.

Directions to the classroom and GEM Secretariat:
<https://www.globalquakemodel.org/contact-us>

PARTICIPATION & SCHOLARSHIPS

The course is open to a limited number of external participants, with **priority given to early career researchers**. There are also up to **10 travel/accommodation scholarships available** for early career researchers from lower / middle income countries (LMIC).

If you would like to attend the course, please send your CV to: register@globalquakemodel.org by 15 November 2026.

INSTRUCTORS

Marco Baiguera,

Exposure Analyst, GEM Foundation

Kirsty Bayliss,

Seismic Hazard Modeller, GEM Foundation

Christopher Brooks,

Seismic Hazard Modeller, GEM Foundation

Alejandro Calderón,

Exposure Research Lead, GEM Foundation

Martina Caruso,

Seismic Risk Modeller, GEM Foundation

Al Mouayed Bellah Nafeh,

Physical Vulnerability Lead, GEM Foundation

Anirudh Rao,

Seismic Risk Modelling Lead,
GEM Foundation

Vitor Silva,

Head of Risk Engineering, GEM Foundation

Catalina Yepes Estrada,

Exposure Development Lead, GEM Foundation

OPENQUAKE ENGINE CERTIFICATION (Optional)

By completing this course and passing the assessment test, participants can receive an OpenQuake Certification for Scenario Analysis. More information here:

<https://www.globalquakemodel.org/openquake-engine-certification>

With this certification, you will be able to:

- Configure and run OpenQuake Engine scenario analyses (covering ground shaking and earthquake-triggered liquefaction and landslide hazards, as well as damage and loss metrics).
- Create reproducible outputs (maps/tables) and explain input models, assumptions, and limitations to decision-makers.

TIMETABLE | 33 hours, typically with lectures in the morning and tutorials in the afternoon:

DAY	WED3 RD	THUR4 TH	FRI5 TH	MON8 TH	TUES9 TH	WED10 TH	THUR11 TH	FRI12 TH
AM	3 HRS	3 HRS	3 HRS	3 HRS	3 HRS	3 HRS	3 HRS	TEST
PM		2 HRS	2 HRS	2 HRS	2 HRS	2 HRS	2 HRS	

Wednesday, February 3rd

9:00 – 12:00

- Quick PSHA refresher
- Components of a PSHA input model:
 - Earthquake sources

Thursday, February 4th

9:00 – 12:00

- Components of a PSHA input model:
 - Ground-motion models
 - Logic trees and modelling of epistemic uncertainties

14:00 – 16:00

- Introduction and exercises with the OpenQuake Engine – Classical PSHA

Friday, February 5th

9:00 – 12:00

- Scenario-based Hazard Analysis
 - Cross-correlated ground-motion fields and conditioning using seismic stations
- Exercises with the OpenQuake Engine – Scenarios

14:00 – 16:00

- Event-based PSHA
- Exercises with the OpenQuake Engine – Event-based PSHA

Monday, February 8th

9:00 – 12:00

- Exposure modelling at urban, regional and national scale
 - Definition of exposure and asset attributes in the context of risk assessment
 - Examples of exposure modelling workflow at different scales
- GEM Building Taxonomy
 - Establishing standardized classification systems for physical building attributes
 - Examples and tools for building classification using GEM Taxonomy v4.0

14:00 – 16:00

- GEM Global Exposure Model
 - Global exposure datasets by the GEM Foundation, overview and access.
 - Preparation of exposure datasets for use with the OpenQuake engine.

Tuesday, February 9th

9:00 – 12:00

- Concepts of fragility and vulnerability modelling
 - Numerical modelling approaches
 - Nonlinear static and dynamic approaches
 - Fragility analysis: conventional and state-of-the-art methods
 - Vulnerability analysis: conventional and state-of-the-art methods
- GEM Vulnerability modelling framework: A-Z on analysis to loss models
- GEM Global Vulnerability database

14:00 – 16:00

- GEM tools (Intro to oq-vmtn) and vulnerability model inputs for the OpenQuake Engine
- Running end-to-end examples for vulnerability assessment of global building classes

Wednesday, February 10th

9:00 - 12:00

- Scenario risk modelling
 - Integrating ground motion, exposure, and vulnerability for comprehensive seismic risk analysis
 - Accounting for soil conditions in seismic risk assessment

14:00 - 16:00

- OpenQuake engine scenario damage and risk calculators
- Scenario modelling exercises

Thursday, February 11th

9:00 - 12:00

- Concepts of Probabilistic Seismic Risk Assessment (PSRA)
- GEM's Global Seismic Risk Model
- OpenQuake Engine risk calculators
- Exercises on event-based seismic risk modelling

14:00 - 16:00

- Advanced risk analysis with the OpenQuake Engine

Friday, February 12th

PRESENTATIONS AND ASSESSMENT TEST

Each group will present the work they have undertaken as part of the assignment.

Course participants will undertake an assessment test which will evaluate both their understanding of GEM models and their knowledge of the use of the OpenQuake Engine for scenario analyses.