

Percorso Autonomo Autorizzato

Title (Titolo)	Computational models in geoscience (CompGeo) (Modelli Computazionali nelle geoscienze)
Coordinator	<ul style="list-style-type: none"> • DMAT, PoliMi: Prof. Edie Miglio
Supporting coordinators	<ul style="list-style-type: none"> • DMAT, PoliMi: Prof. Luca Formaggia, • DICA , PoliMi: Prof. Luigi Zanzi
Scientific collaborations and partnerships	<ul style="list-style-type: none"> • Department of Civil and Environmental Engineering, Politecnico di Milano, Prof. Alberto Guadagnini, Prof. Paolucci Roberto, Prof. Monica Riva, Dr. Giovanni Porta. • Prof. Rainer Helmig (University of Stuttgart), Prof. Daniele di Pietro (University of Montpellier), Prof. Roland Masson (University of Nice), Prof. Inga Berre (University of Bergen) • Eni SpA: Dr. Paolo Ruffo, Dr. Alberto Cominelli, Dr. Stefano Mantica, Dott.ssa Matilde della Rosa, Dr. Stefano Carminati • Munich Re: Dr. Marco Stupazzini
Description and aim	This PAA aims to develop skills regarding the main mathematical, numerical as well as statistical models used for the description of complex engineering and physical systems related to the field of geosciences. The PAA aims at combining the peculiar educational features that characterize the LM in Mathematical Engineering with some of the skills associated to the study of the geological and geophysical problems encountered in practical applications (such as in the field of petroleum engineering). The PAA will comprise basic courses concerning geomechanics, flow in porous media and engineering seismology and it includes specific numerical and statistical methods for applications in Earth Sciences.
Study Plan	The programme of studies in CompGeo belongs to the Major in “Computational Sciences” with additional foundations in Engineering Seismology, Flow in Porous media, Geostatistics and Geomechanics. The list of courses can be found in a separate document.
Past MSc theses	<ul style="list-style-type: none"> • Alessandra Menafoglio “Geostatistics for elements of a Hilbert Space: theory and application to functional data” • Calogero Rizzo “3D upscaling of reservoir properties using the mixed finite element method on non-matching grids” • Luca Turconi “Transmissibility upscaling for fluid flow in porous media on non matching grids” • Bianca Giovanardi “Numerical modeling of porosity evolution in source rock during kerogen breakdown” • Maria Iemoli “Modello numerico di un flusso bifase in un network di fratture” • Luca Pasquale “A mesh interpolation and upscaling algorithm for three dimensional basin modeling”
Available subjects for an MSc thesis	<ul style="list-style-type: none"> • <i>Mathematical and numerical models for flow in fractured porous media</i> • <i>Coupled flow and geomechanics</i> • <i>Mathematical and numerical model in geodynamics and seismology</i> • <i>Geostatistics applied to spatially distributed and functional data</i>
Industrial internships	We will exploit the contacts in Eni SpA and Munich Re to offer internships. Already in the past several students of Mathematical Engineering have carried out their final thesis within an internship in Eni on subject relevant to this PAA. Other internships may be available at other Italian and foreign companies like Schlumberger, IFPEN and SIMULA, with which we have several contacts.
Work opportunities	Companies and research laboratories in the areas of Geology, Geophysics, Environment, Geothermal Energy and Petroleum Engineering.