Percorso Autonomo Autorizzato

Title (Titolo)	**Computational models in geoscience (Modelli computazionali nelle geoscienze)**
Chief (Referente responsabile)	(DMAT, PoliMi): prof. Edie Miglio
Supporting Coordinators (Altri referenti)	(DMAT, PoliMi): prof. Luca Formaggia (DICA, PoliMi): prof. Luigi Zanzi
Scientific collaborations and partnerships (Collaborazioni scientifiche nazionali ed internazionali)	• DICA, PoliMi: prof. Alberto Guadagnini, prof. Paolucci Roberto, prof. Monica Riva, dr. Giovanni Porta • University of Stuttgard: prof. Rainer Helmig • University of Montpellier: prof. Daniele di Pietro • University of Nice: prof. Roland Masson • University of Bergen: prof. Inga Berre • Eni SpA: dr. Paolo Ruffo, dr. Alberto Cominelli, dr. Stefano Mantica, dr.ssa Matilde della Rosa, dr. Stefano Carminati • Munich Re: dr. Marco Stupazzini
Description and goals (Descrizione ed obiettivi)	This program 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 program aims at combining the peculiar educational features that characterize the MSc 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 program 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 (Piano di studi)	The program of studies in *Computational models in geoscience* belongs to the Major (PSPA) in *Computational Science and Engineering* 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 (Alcune Tesi discusse)	• F. Sottocasa (Ing. Mtm.), *Formulazione mista per flussi in mezzi porosi fratturati: approssimazione con le differenze finite mimetiche*, 2016 • M. Iemoli (Ing. Mtm), *Modello numerico di un flusso bifase in un network di fratture*, 2015 • C. Rizzo (Ing. Mtm), *3D upscaling of reservoir properties using the mixed finite element method on non-matching grids*, 2014 • L. Pasquale (Ing. Mtm), *A mesh interpolation and upscaling algorithm for three dimensional basin modeling*, 2014 • B. Giovanardi (Ing. Mtm.), *Numerical modeling of porosity evolution in source rock during kerogen breakdown*, 2013 • L. Turconi (Ing. Mtm), *Transmissibility upscaling for fluid flow in porous media on non matching grids*, 2012 • A. Menafoglio (Ing. Mtm.), *Geostatistics for elements of a Hilbert Space: theory and application to functional data*, 2011
(Available subjects for a MSc thesis) (Tesi disponibili)	• *Mathematical and numerical models for flow in fractured porous media* • *Coupled flow and geomechanics* • *Mathematical and numerical model in geodynamics and seismology* • *Geostatistics applied to spatially distributed and functional data*
Internships (Tirocini)	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.
Job opportunities (Sbocchi lavorativi)	Companies and research laboratories in the areas of Geology, Geophysics, Environment, Geothermal Energy and Petroleum Engineering.