Percorso Autonomo Autorizzato

Title (Titolo)	**Computational Structural Mechanics (Calcolo strutturale)**
Chief (Referente responsabile)	(DICA, PoliMi): prof. Alberto Corigliano, prof. Attilio Frangi
Supporting Coordinators (Altri referenti)	(DICA, PoliMi): prof. Alberto Taliercio
Scientific collaborations and partnerships (Collaborazioni scientifiche nazionali ed internazionali)	• (DEIB, PoliMi): prof. Andrea Lacaita, prof. Giacomo Langfelder • (DMEC, PoliMi): prof. Alfredo Cigada, prof. Francesco Braghin • (DCMIC, PoliMi): prof. Roberto Frassine, prof. Luca Magagnin, prof. Marinella Levi • (DSTA, PoliMi): prof. Aldo Frezzotti • (DMAT, PoliMi); prof. Silvia Lorenzani • (Dip. Ing. Civile, Ambientale e Meccanica, UniTn): prof. Davide Bigoni, prof. Nicola Pugno. • (Département de Mécanique, Ecole Polytechnique, Paris, Francia), prof. Patrick Le Tallec, prof. Jean-Jacques Marigo • (Laboratoire de Mécanique et Technologie (LMT), ENS Cachan, Francia): prof. Pierre Ladeveze, prof. Olivier Allix • (LaMCos, INSA Lyon, Francia): prof. Alain Combescure. • (Karlsruhe Institute of Technology, Germania): prof. Jan Korvink • (Dept. of Mechanical Engineering, Northwestern University, Evanston IL, USA): prof. Horacio D. Espinosa • (Dept. Mechanical Engineering, MIT, USA): prof. Sang-Gook Kim, Luca Daniel • (Dept. Mechanical and Aerospace Engineering, Univ. California Davis, USA): prof. David Horsley • and many other collaborations of DICA faculty members on Computational Structural Mechanics subjects.
Description and goals (Descrizione ed obiettivi)	The offered study plan is related to scientific computation with particular reference to Computational Structural Mechanics. This discipline refers to Structural Engineering, Civil in particular, where numerical spatial discretization methods like the Finite Element Method have been initiated and developed in the 50s and 60s of the last century. Starting from the strong theoretical basis acquired by the Mathematical Engineer during the undergraduate course, during the Master of Science, inside the Computational Sciences study plan, various subjects are proposed for a more in-deep knowledge of theory and practice of computational structural mechanics and for the assessment of structural integrity. After an additional year of study, the proposed study plan allows the student to obtain the Master of Science in Civil-Structural Engineering in addition to the Master of Science in Mathematical Engineering.
Study Plan (Piano di studi)	The Study Plan is built on the PSPA (Major) *Computational Science and Engineering* with the addition of courses related to: the behaviour and mathematical modelling of structures (*Theory of Structures*), the Finite Element Method applied to structural analysis (*Computational Mechanics*), the study of the dynamical behaviour of structures (*Elements of dynamic of Structures*), the assessment of structural integrity in the presence of instable responses (*Stability of Structures*) and of elasto-plastic material behaviour (*Inelastic Structural analysis*). The precise list of courses can be found in a separate document.
Past MSc theses (Alcune Tesi discusse)	• M. Cremonesi (Ing. Mtm.), *Implementazione di tecniche di parallelizzazione e di un metodo lagrangiano a particelle di fluido finalizzati allo sviluppo di un codice di calcolo ad elementi finiti per problemi di interazione fluido-struttura*, 2006 • E. Greco (Ing. Mtm.), *Metodi per la valutazione della dissipazione viscosa nei MEMS*, 2007

	• D. Arosio (Ing. Mtm.), *Modellazione e simulazione di fenomeni di adesione in microsistemi*, 2010 • F. Rizzini (Ing. Mtm.), *Modelli semplificati e ad elementi finiti per la simulazione di fenomeni di adesione in microsistemi*, 2012 • A. Bugada, M. Martello. (Ing. Mtm.), *Modellazione e simulazione di fenomeni dissipativi in microsistemi*, 2012 • V. Zega (Ing. Mtm.), *Risonatore torsionale per microsistemi: modellazione, sperimentazione, applicazioni*, 2013 • P. Fedeli (Ing Mtm) *Fenomeni dissipativi in microsistemi elettro meccanici* 2015 • G. Rovi (Ing. Mtm), *Particle Finite Element Method: 3D Lagrangian Compressible Navier-Stokes*, 2016 …and many others done by students of Civil Engineering and Materials Engineering and Nanotechnology.
Available subjects for a MSc thesis (Tesi disponibili)	· Modelling and simulation of fluid-structure interactions · Model Order Reduction techniques applied to the simulation of non-linear microsystem response · Modelling and simulation of surfaces interactions and dissipative phenomena in microsystems · Modelling and simulation of non-linear dynamics in microsystems · Modelling and simulation of multi-physics phenomena · Multi-scale and domain decomposition methods applied to the simulation of fracture processes in polycrystalline and/or micro structured materials · … and many other thesis subjects related to Computational Structural Mechanics, proposed by DICA faculty members.
Internships (Tirocini)	Stages at STMicroelectronics and ABB. Other possible stages in companies with stable connections with DICA faculty members working in Computational Structural Mechanics, e.g. Tetrapak, Eni, A2A, …
Job opportunities (Sbocchi lavorativi)	All job opportunities of the M.Sc. in Mathematical Engineering. Additional possibilities as stress analyst and designer in Structural design groups and companies.
DD Mathematical Engineering - Civil Engineering (Doppia Laurea Magistrale Interna)	The student following the Computational Structural Mechanics curriculum will have the possibility to enter in the double degree curriculum "Mathematical Engineering + Civil Engineering". With an additional year of study, the Graduate in Mathematical Engineering will obtain the degree in Civil, Structural Engineering; details can be found at: http://www.ingindinf.polimi.it/didattica/doppie-lauree-interne/