Percorso Autonomo Autorizzato

Titolo	Mathematical and physical modeling for nuclear application
Referente responsabile	(DENG, PoliMi): ing. Matteo Passoni
Altri referenti	(DENG, PoliMi): prof. Stefano Agosteo
Collaborazioni scientifiche nazionali ed internazionali	The Professors involved in this PAA (and more generally in the MSc Program in Nuclear Engineering) have established teaching and research collaborations with prestigious foreign universities such as the Massachusetts Institute of Technology (MIT), the University of California at Los Angeles (UCLA), the Tokyo Institute of Technology (TITECH), the French "Grandes écoles", the University of Cambridge, Oxford and Durham, the Ecole Polytechnique Federale de Lausanne (EPFL), the Georgia Institute of Technology (GeorgiaTech), the Technical University of Munich (TUM), the Technical University of Delft (TUD). In addition, they have partnerships with prestigious national and international research institutions, such as CNR, ENEA, CERN, JRC, ITU, KIT, JET, ITER. Active collaborations with various departments of Politecnico di Milano, for both teaching and research, can be found as well.
Descrizione ed obiettivi	This PAA is part of the PSPA (Major) in "Computational Science for Engineering" and aims to suitably develop the skills regarding physical-mathematical models used for the description of complex engineering and physical systems such as, for example, those that characterize nuclear systems and the physics of matter. The PAA in "Mathematical and physical modeling for nuclear applications" 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 physics of matter and the design of nuclear systems. In particular, the proposed educational program will allow to achieve a suitable preparation to understand and develop skills in areas such as: i) nuclear reactor physics; ii) hot and thermonuclear plasma physics; iii) safety and risk assessment of complex systems, such as nuclear power plants; iv) solid-state and condensed matter physics.
Piano di studi	The Study Plan is built starting from the PSPA (Major) in "Computational Science", with the addition of courses related to the study of the physics of nuclear reactors (*Fission Reactor Physics*), the computational methods used for assessing the safety and reliability of complex systems (*Reliability, safety and risk analysis A*), plasma physics (*Plasma physics*) and physics of crystalline solids (*Solid state physics A*).
Tesi discusse	• A. Bertagna (Ing. Mtm.), *Studio di modelli per l'accelerazione di ioni mediante impulsi laser ultraintensi e ultrabrevi*, 2009 • S. Piccoli (Ing. Nuc.), *Sviluppo di metodi per la descrizione teorica e l'analisi di misure di spettroscopia a scansione per effetto tunnel*, 2011 • I. Prencipe (Ing. Nuc.), *Studi teorici sull'accelerazione di ioni mediante interazione tra impulsi laser ultraintensi e materia*, 2011 • M. Gerosa (Ing. Nuc.), *Studio teorico-computazionale sulla propagazione di luce in un materiale gerarchico multiscala*, 2012 • A. Balestrero (Ing. Nuc.), *Maintenance modeling based on effective age, fuzzy logic and Montecarlo simulation*, 2011 • M. Rigamonti (Ing. Nuc.), *Development of a framework for unsupervised classification of nuclear transients*, 2012 • S. Sauco (Ing. Nuc.), *Ensemble of neural networks for fault prognostics of industrial equipments*, 2011.
Tesi e Tirocini disponibili	Please contact the Professors of the courses which characterize this PAA
Sbocchi lavorativi	Every job opportunity related to the LM in Mathematical Engineering with specialization in the PSPA in "Computational Science". More specifically, the education obtained following this PAA, ideally completed with a MSc thesis dedicated to one of its specific areas, will result in a professional profile characterized by a high-level preparation in the field of analytical and numerical modeling of complex systems, suitable to be exploited in many areas of modern industrial engineering, physics / materials science and research.

Seconda LM in Ingegneria Nucleare	To obtain the LM in Nuclear Engineering, students who got the LM in Mathematical Engineering, with a PAA in "Mathematical and physical modeling for nuclear applications" and a thesis in a nuclear field, must acquire additional 55 credits from courses taken within a third year. In the final examination, the students will be able to bring the same thesis discussed to obtain the MSc in Mathematical Engineering. See the Table below.