Traineeship program at The Department of Sciences and Methods for Engineering - Reggio Emilia

Name and Contact	Main topic/field of the Traineeship	Areas of study and education level of the ideal candidate	Skills/Language requirements	Goals and activities
1. **Pietro Bilancia** (pietro.bilancia@unimore.it)	Design Methods and Tools for Industrial Engineering	Mechanical/Mechatronic/Automation Engineering	ENG: Upper-Intermediate (B2)	Development of innovative methods and tools for the integrated design, virtual prototyping and testing of robotic and mechatronic systems in the context of I4.0: robot accuracy, energy-efficient flexible robotic cells, zero-defect robotic manufacturing systems.
2. **Luke Mizzi** (luke.mizzi@unimore.it)	Mechanical/Materials Engineering - Metamaterials	Mechanical Metamaterials, Smart Materials and Structures, Biomedical Engineering, Mechanical Engineering, Materials Science, Solid State Physics. Both bachelor and masters level students can apply	Ideally B2 level English. Previous basic experience with Finite Element simulations is also a plus	The traineeship will involve studies on the development of mechanical metamaterials with unusual characteristics such as negative mechanical properties. Simulation work will be carried out to test the functionality of these new systems, followed by experimental tests on prototypes produced through 3D printing and laser cutting. The students will learn how to conduct parametric analyses through Finite Element Simulations and familiarise themselves with experimental methods used to validate these studies.
3. **Davide Castagnetti** (davide.castagnetti@unimore.it)	Machine Design	Mechanical Engineering	English or Italian	Smart materials for energy harvesting
4. **Stefano Mariani** (stefano.mariani@unimore.it)	Data Science and Artificial Intelligence	Masters degree in Computer Science or Engineering	Proficiency in English	Develop and apply causal data analysis techniques and causal machine learning techniques to create causal graphs and performa causal bayesian inference Develop and apply reinforcement

					learning techniques to multi-agent problems in domains such as swarm intelligence, cooperative robotics, videogames
5.	**Luca Montorsi** (luca.montorsi@unimore.it)	Energy Conversion Systems and Environmental Impact	Energy efficiency in industrial processes, heat recovery, renewable energy sources, advances heat exchangers, metallic fuels, hydrogen generation. Both master and bachelor students are welcome (goals and activities will be set accordingly)	English level B2 strongly recommended	The traineeship will be in the domain of energy efficiency improvement and reduction of environmental impact of industrial process. Technologies for exploiting renewable energy sources for industrial application are analyses as well as innovative hydrogen production concepts. The activities can involve both experimental work on prototypes and numerical simulation of the systems.
6.	**Silvia Barbi** (s.barbi@unimore.it)	Materials Science and Engineering	Materials Science, Engineering and Technology; Statistics; Environmental Sciences; Management Engineering. Master students are welcome	English level B2 strongly required	The activity will be focused on the formulation and development of materials based on second raw or natural materials, in order to limit the environmental impact. Statistical approaches will be employed in order to collect the experimental dataset and to calculate mathematical models describing the materials performances depending on the formulation.
7.	**Fabrizio Pancaldi** (fabrizio.pancaldi@unimore.it)	Digital Signal Processing	Graduate or undergraduate students in computer science, electrical engineering, electronic engineering, communications engineering, biomedical engineering.	English B2. Basic knowledge of scientific programming, for instance Matlab and/or Python.	The diagnosis of interstitial lung diseases secondary to autoimmune diseases is fundamental for improving the survival rate of patients. The gold standard for confirming the diagnosis of these diseases is computed tomography. However, raising the diagnosis suspicion is very difficult because the symptoms are extremely common in elderly people. Thoracic auscultation has shown a huge potential in the early detection of interstitial lung diseases, but still

				represents an under-explored field. The goals of this project are: (a) developing novel algorithms, both model-based and data-driven (i.e. relying on machine learning and deep learning), for the analysis of lung sounds and the early detection of interstitial lung diseases; (b) designing a new electronic stethoscope suitable to quantitatively support physicians in the prescription of computed tomography.
8. **Marco Picone** (marco.picone@unimore.it)	Computer science, Computer Engineering.	Both master and bachelor students are welcome (goals and activities will be set accordingly)	English level B2 strongly recommended. Basic knowledge of Python, Java or C/C++.	The traineeship will be in the domain of Internet of Things (IoT), Pervasive Systems and Digital Twins. The goal will be the study of design and development of distributed and pervasive system with the aim to allow a simplified interaction among users, devices and services and to introduce intelligent capabilities to cyber-physical systems. Specific objectives will be defined. They might include measurement and analysis of IoT protocols and architectural components, design and development of Digital Twins through different application domains and the creation of intelligent application for the interaction between physical assets and users in pervasive environments.
9. **Enrico Radi** eradi@unimore.it	Mechanics of solids and structures	Civil engineering Mechanical engineering Master Degree	English – Fluent	Analysis of stress concentration in fracture, contact and dislocation problems. Effective properties of composite materials. Modelling of the termomechanical behavior of Shape memory alloys beams.

10. Federica Ferraguti federica.ferraguti@unimore.it	Robotics	Computer science Mechatronic engineering Robotics Biomedical engineering Both master and bachelor students are welcome (goals and activities will be set accordingly)	English level B2 strongly recommended. Basic knowledge of programming (C++ or Python).	The traineeship will be in the domain of surgical robotics. The goal will be the development of advanced technologies for supporting the surgeon during the execution of the intervention. Main topics that can be addressed are: application of Artificial Intelligence to surgical robotics, augmented and virtual reality for assisting the surgeon, autonomous and semi-autonomous surgical robots, shared control for surgical robots.
11. Federica Ferraguti federica.ferraguti@unimore.it	Robotics	Computer science Mechatronic engineering Robotics Both master and bachelor students are welcome (goals and activities will be set accordingly)	English level B2 strongly recommended.	The traineeship will be in the field of collaborative robotics and physical human-robot interaction. The goal will be the development of advanced control algorithms for improving the performance of the collaborative robotics systems while satisfying the safety regulations for guaranteeing the safety of the human operator.
12. Paolo E. Santangelo paoloemilio.santangelo@unimore.it	Thermal fluids	Mechanical engineering (preferred) or related programs; Bachelor's and Master's students equally welcome	English B2 (CEFR) strongly recommended Basic knowledge of MS Excel and Matlab for data processing strongly recommended; previous experience in experimental research welcome	The overall scope consists of assessing thermophysical properties of biomaterials (or innovative materials) to be employed in the construction industry. Notably, experimental techniques (e.g., guarded hot plate) and approaches will be used to the purpose. Candidates are expected to acquire the ability to perform quantitative experiments and ultimately build a sound dataset of the analyzed properties. The involved activities may be performed in collaboration with and at another

				UNIMORE Department (i.e., DIEF, located in Modena, Italy).