UNIMORE
UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

Dipartimento di
Scienze e Metodi dell'Ingegneria

www.dismi.unimore.it

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

Main topic/field of the Traineeship	Areas of study and education level of the ideal candidate	Skills/Language requirements	Goals and activities
Project Nr. 1 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.

Project Nr. 2 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.
Project Nr. 3 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.

Project Nr. 4 Software engineering, Artificial Intelligence, Distributed systems	Both master and bachelor students with programming skills (e.g. Computer Science, Engineering, Applied Mathematics, Data Science, ...)	English level B2 highly recommended Any programming skills (best if Java / Kotlin / Python)	The work will mostly regard application of artificial intelligence techniques (machine learning, logic programming, planning) for the engineering of distributed systems. Specific activities will likely include design and development of new software libraries and applications and use of third party software libraries and simulation tools. Topics covered may include: application of bayesian and causal learning techniques to the Internet of Things, application of reinforcement learning and causal inference in multiagent systems, conception and design of coordination models for multiagent systems, conception and design of argumentation protocols and application to the Internet of Things.
Project Nr. 5 Telecommunications - Signal processing	Graduate or undergraduate students in Computer Science or Electrical Engineering	B2 english or B1 italian	Measurement of the damping factor of car dampers using force sensors and accelerometers
Project Nr. 6 Machine Design	Mechatronic Engineering Mechanical Engineering Master Degree	English language	Efficient structures for energy harvesting, 3D printed strructures for biomechanic applications, structural bonded joints analysis and experimental characterization, structural optimization.
Project Nr. 7 Finanza di Progetto/ Project financing	Magistrale/Master Degree	English C1 Italian	Supporto alla valutazione e gestione tecnico operativa di progetti nell'ambito della finanza di progetto rinnovabili trasporti logistica energia telecomunicazioni infrastrutture sanitarie/Supporting the evaluation and the technical-operational

			management in the field of renewable project financing regarding transports, logistics, energy, telecommunication, health facilities
Project Nr. 8 Dynamical Systems	Mathematics Physics Computer science Both master and bachelor students are welcome (goals and activities will be set accordingly)	English level B2 is strongly recommended Basic knowledge of both the theory of differential equations and Matlab are preferred	The traineeship will be in the study of some quantitative model coming from Physics, Thechnology, Biology or collective movements theory. The well-posedness of such model will be preliminarly discussed, by means of the main tools of the dynamical systems theory. The model will then be validated with concrete data.
Project Nr. 9 Mechanical Design, smart materials, metamaterials and structural adhesives	MS in mechanical or mechatronic engineering	B2 at least	Design of novel actuators and systems based on Shape memory alloys or metamaterials
Project Nr. 10 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	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).

		experimental research welcome	
Project Nr. 11 Embedded systems Design	Master Degree	English/Italian	Development of Embeddded Systems for Industrial Applications.
Project Nr. 12 Operations Research	Master students in Management (Industrial) Engineering, IT Engineering, Informatics, or Mathematics	Advanced knowledge of English is required	The student will work in a multidisciplinary team involving bachelor, master and PhD students from Engineering, Informatics and Mathematics. A research theme will be defined before arrival, in the context of optimization methods for logistics or production. The activity will possibly involve a company operating in Reggio Emilia or in the surrounding area. Examples of such problems involve the routing of vehicles to satisfy customer requests, or the scheduling of activities on machines. The student will have to understand the problem, formalize it in mathematical terms, and then propose a solution algorithm. All such activities will be performed with the support of the group. Everyday presence at the laboratory is not required, and advances will be discussed through group meetings on a weekly basis, so as to meet the project milestones. Some programming knowledge is required, in languages such as C/C++ or Python.

Project Nr. 13 Robotics and automation	Computer science, electrical engineering, robotics, biomedical engineering, cognitive engineering, interaction design. Both master and bachelor students are welcome (goals and activities will be set accordingly)	English level B2 strongly recommended Basic knowledge of Matlab and/or Python preferred	The traineeship will be in the domain of human-robot interaction. The goal will be the study of interaction modalities (for example, gestures) that allow easy interaction with complex systems. Specific objectives will be defined. They might include measurement and analysis of physiological signals for monitoring user's status during interaction and use of virtual reality for the design of novel interaction modalities.
Project Nr. 14 Applied Mechanics	Mechanical or Mechatronic engineering preferred; Bachelor's and Master's students equally welcome	English level B2 strongly recommended.	The traineeship will be in the field of Mechanics of Vibration and condition monitoring. The candidate will do experimental activity acquiring data from test rigs, and processing of data evaluating existing algorithms for diagnostics of mechanical components and developing new ones.
Project Nr. 15 Management Engineering: Technology Organization and Processes	Masters' and Bachelors' students in Management, Management Engineering or Computer Science	Working and research language: English, basic programming skills and understanding of statistics/econometrics appreciated.	Potential trainees will be assigned to mid- or long-term research projects regarding the area of technology organization and processes (TOP) which aim at studying new forms of collaboration, organization, and value propositions in the adoption of new technologies such as artificial intelligence and blockchain. Some of the puzzles that we try to solve regard: how a technology is understood and used in the different layers of a technology ecosystems, what are the dynamics and outcomes of cross-sector partnerships which strive at both social and technological purposes; what are

			individuals' incentives, motivations and participation practices in online labor markets, how being part of multiple teams shapes organizational performance, and how acquiring and sharing knowledge shapes how individuals see themselves in the work sphere. The trainees will play the role of research assistant within multiple active research projects and sub-projects, acquiring research skills, data analysis skills, transversal learning, teamwork and project design skills within multidisciplinary teams, performing the following tasks: -Research and systematization of material (articles, reports, scientific articles, multimedia material) -Use of scientific databases and writing of literature reviews -Big data extraction -Creation of qualitative / quantitative data database -Transcript of interviews, podcasts, other primary and secondary data analysis sources -Training for data analysis with special software (Dedoose for qualitative analysis, R for statistical analysis, etc.)
Project Nr. 16 Thermal fluids	Mechanical engineering (preferred) or related programs; Bachelor's and Master's students equally welcome	English B2 strongly recommended; basic knowledge of CAD, GNU/Linux operating systems and command line interfaces; programming and data	The candidate will undertake research work regarding convective heat transfer in industrial systems (heat exchangers, cooling of power systems and electronic devices), and/or fundamental research on transitional and turbulent convection. The research will be carried out mainly by means of CFD (Computational Fluid Dynamics) tools, with either in-house codes or open source/commercial packages. The involved activities may be performed in collaboration with and at another

		analysis skills are welcome.	UNIMORE Department (i.e., DIEF, located in Modena, Italy). The specific topic will be agreed with the candidate while finalizing the agreement.
Project Nr. 17 Materials Science and Tecnologies	Materials engineering, mechanical and mechatronic engineering, management engineering. Master degree students are welcome	English level B2 strongly recommended Basic knowledge of materials science	The traineeship will be in the domain of customized electronic components intended for new areas of application is constantly growing thanks to the recent development of low-cost printing technologies that allow the creation of PCBs even on a flexible support. The project aims to develop and customize high-density inks to be used in the production of electronic components and circuits on flexible media. The formulation of the inks will be designed using a statistical mixture design approach with the aim of generating predictive mathematical models of the properties of interest, which will be experimentally validated. The preferential areas of application of the components under study are sectors such as smart textile (wearable electronics), robotics (e-skin sensors) and automotive
Project Nr. 18 Fluid Power Systems and Components	Mechatronic Engineering Mechanical Engineering	English level B2 or Italian level B1 strongly recommended	The traineeship will be in the field of Fluid Power and Fluid Automation systems and components. In particular, the candidate will develop and validate lumped and distributed numerical models for simulating the operation of circuits and components for fluid power applications.

	Bachelor's and Master's students equally welcome		
Project Nr. 19 Random complex systems	Mathematics Physics Computer science Both master and bachelor students are welcome (goals and activities will be set accordingly)	English level B2 is recommended Basic knowledge of probability and Matlab. Any programming skills are preferred	The traineeship will be in the domain of stochastic models of disordered interacting systems. Prototypical examples are Ising models on random graphs. For such models, specific objectives will be defined. Possible goals might be the study of the thermodynamic properties emerging from the different averaging procedures that can be applied to cope with the multiple randomness present in such systems.