

PhD Programme	ANIMAL AND FOOD SCIENCE
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Development of smart technologies for welfare of laying hens under farming conditions
Supervisor	Angela Trocino
Supervisor Email	angela.trocino@unipd.it
Project description	Precision Livestock Farming (PLF) techniques have the potential to improve animal welfare through providing a continuous picture of welfare states in real time and enabling fast actions that benefit the current flock. As for poultry, PLF most commonly focused on broiler chickens and mainly involved the use of sensors (environmental and wearable) and cameras besides optical and radio-frequency sensors to monitor environmental parameters (temperature and humidity) and to track movement and behaviours. As for laying hens, since the housing environment is complex, the development of PLF tools is requested to be housing-specific for these animals and less studies are available until now. The project will adopt conventional and PLF tools for monitoring i) environment; ii) animals; and iii) management by data collection and elaboration of production efficiency and behaviour animal-based indicators in laying hens also in relation with environmental conditions.
Mandatory traineeship	6
Company cofinancing	Officine Facco & C. S.p.A.

PhD Programme	BIOSCIENZE
Curriculum (if foreseen)	Biochimica e Biotecnologie
Type of scholarship	Ex DM 117/2023
Project title	Multi-omic exploration for characterizing oenologically relevant yeast strains
Supervisor	Laura Treu
Supervisor Email	laura.treu@unipd.it
Project description	The theme of this project is focused around the bioinformatic analysis of <i>Saccharomyces cerevisiae</i> strains of oenological interest, primarily belonging to the collection of the company Italiana Biotecnologie S.r.l.. This microorganism holds significant importance in numerous biotechnological applications, both in the fermentation of beverages and food, and in the production of biofuels. In recent years, the development of bioinformatic techniques for genomic and transcriptomic analysis has revolutionized theoretical and applied studies related to this microorganism. In this project, in collaboration with the funding company, we aim to develop and apply bioinformatic analysis techniques for the characterization and selection of strains of interest, as well as for the improvement of their phenotypic characteristics in winemaking.
Mandatory traineeship	6
Company cofinancing	Società ITALIANA BIOTECNOLOGIE S.r.l.

PhD Programme	BIOSCIENZE
Curriculum (if foreseen)	Evoluzione, Ecologia e Conservazione
Type of scholarship	Ex DM 117/2023
Project title	Bio-inoculants and sustainability: exploiting the role of microbial biodiversity carried by compost in promoting soil and plant health
Supervisor	Barbara Baldan
Supervisor Email	barbara.baldan@unipd.it
Project description	Soil microbial community is vital for plant resilience against various stresses (e.g., nutrient deficiency, water scarcity, poor soil quality, pollution). EU's soil improvement strategies focus on restoring microbial biodiversity to enhance soil quality across Europe, and mitigate climate change effects on plants. Compost from food and plant waste can be a source of microbial biodiversity. This research project aims to: (i) assess compost's biological diversity and its role in enhancing soil biodiversity, (ii) isolate microorganisms from compost and study their plant growth-promoting traits, (iii) examine root colonization by bacterial strains, (iv) evaluate the impact of microbe-enriched compost on plant growth and yield, and (v) identify plant genes involved in compost microbiota-plant interactions. This innovative strategy offers sustainable solutions for environment, in order to improve the soil and plant health.
Mandatory traineeship	6
Company cofinancing	S.E.S.A. Società Estense Servizi Ambientali S.p.A.

PhD Programme	BIOSCIENZE
Curriculum (if foreseen)	Genetica, Genomica e Bioinformatica
Type of scholarship	Ex DM 117/2023
Project title	Dissecting the mechanism controlling human naïve pluripotency and differentiation towards placenta
Supervisor	Graziano Martello
Supervisor Email	graziano.martello@unipd.it
Project description	Human pluripotent stem cells have the capacity to give rise to all cell types found in the body. Pluripotent stem cells are obtained either from embryos, as embryonic stem (ES) cells, or via reprogramming of somatic cells, as induced pluripotent stem (iPS) cells. We generated human iPS cells in a more primitive developmental state, named naïve pluripotency, characterized by the capacity to form embryonic tissues like the placenta and the yolk sack. We have a limited understanding of the factors (i.e. cell signals, epigenetic modifiers and transcription factor) controlling human naïve pluripotency and those controlling the differentiation toward the placenta. The aim of the project is to identify crucial regulators of human naïve pluripotency by performing a CRISPR screening combined with transcriptomic and epigenomic analyses. The results obtained will have strong implications for the use of human naïve pluripotent cells as a model of early development and placental defects.
Mandatory traineeship	12
Company cofinancing	Fondazione Telethon ETS

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Scholarship funded by Dipartimento di Scienze Biomediche
Project title	Implementing the DOME recommendations framework for Machine Learning in the Life Sciences
Supervisor	Silvio Tosatto
Supervisor Email	silvio.tosatto@unipd.it
Project description	The DOME project (Walsh et al., Nature Methods 2021) has developed a set of recommendations for reporting supervised machine learning-based analyses applied to biological studies, with the aim of improving machine learning assessment and reproducibility. The project will involve the development of a registry to capture DOME-related information from existing and future literature, along with the definition of metadata describing DOME to be adopted by journals and profiles for quality to help ensure adherence to the recommendations. To facilitate the evaluation of DOME recommendations in scientific articles, a machine learning tool will be developed to automatically assess compliance. Additionally, training materials will be created to explain what DOME is, the registry, and other available tools. Overall, this project aims to promote a more standardised and reproducible approach to machine learning-based analyses.
Mandatory traineeship	n.a.
Company cofinancing	Dipartimento di Scienze Biomediche

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Ex DM 117/2023
Project title	Artificial intelligence models for generating music based on the cross-modal interaction between sound and other senses
Supervisor	Antonio Rodà
Supervisor Email	antonio.roda@unipd.it
Project description	The goal of the project is to study and test artificial intelligence models for generating music and sound according to neuroscience principles related to sensory synesthesia and cross-modality of the senses. Therefore, research should address computational models of music composition related to cross-modal interaction between senses and sound, psychoacoustics, and expressiveness in music.
Mandatory traineeship	6
Company cofinancing	SoundFood Srl

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Ex DM 117/2023
Project title	Security analysis of Android devices used for payment transactions and fiscal data storage
Supervisor	Eleonora Losiouk
Supervisor Email	eleonora.losiouk@unipd.it
Project description	<p>Payment methods on physical devices have been recently replaced by solutions running on smartphones that use wireless technologies (e.g., Bluetooth, NFC). Despite the benefits, mobile devices, particularly the Android ones, introduce security risks, when used to complete a payment, which have not been addressed by the Android Security community so far.</p> <p>The project focuses on this technology, which enables mobile devices to receive payments in contact/contactless mode, and aims to provide solutions to make it secure through: identification of vulnerabilities and implementation of attacks against Android devices enabled to receive payments via contact/contactless technology; development of defense mechanisms; security analysis of tax data management mechanisms on mobile technology; development of solutions for secure storage of tax data on mobile devices.</p>
Mandatory traineeship	6
Company cofinancing	RCH S.p.A.

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Ex DM 117/2023
Project title	Artificial Intelligence for Industrial Ecological Transition
Supervisor	Gian Antonio Susto
Supervisor Email	gianantonio.susto@unipd.it
Project description	Development of Artificial Intelligence approaches for the green revolution and ecological transition in the industrial sector: data-driven technologies (e.g., predictive maintenance, anomaly detection, defect recognition, etc.) will be developed to reduce waste and improve quality and sustainability in the industrial context, such as in semiconductor manufacturing.
Mandatory traineeship	18
Company cofinancing	Statwolf Data Science Srl

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Ex DM 117/2023
Project title	Deep Learning for Object Detection and Tracking in Noisy Scenarios
Supervisor	Lamberto Ballan
Supervisor Email	lamberto.ballan@unipd.it
Project description	Object detection and tracking has recently achieved substantial success thanks to the introduction of deep learning models and the availability of large annotated datasets. However, maintaining accuracy in object detection and tracking within noisy scenarios presents a significant challenge. This difficulty arises from a multitude of factors such as poor lighting conditions, image degradation, occlusions, rapid or irregular object movements, and variations in the object's appearance. This challenge is further magnified in medical video analysis due to the inherent intricacies of biological data and the need for precise identification, where inaccuracies could potentially result in misdiagnosis. This PhD project is poised to address these challenges by devising state-of-the-art techniques tailored for object detection, tracking, and re-identification in several high-noise scenarios.
Mandatory traineeship	6
Company cofinancing	Cosmo Intelligent Medical Devices

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Ex DM 117/2023
Project title	Cyber Threat Intelligence
Supervisor	Mauro Conti
Supervisor Email	mauro.conti@unipd.it
Project description	Cyber Threat Intelligence (CTI) relates to the activities of collection and distribution of cyber-threats such as Advanced Persistent Threats (APTs), possibly involving automatic techniques such as Natural Language Processing (NLP). The aim of this project is the proposal of novel techniques to improve CTI activities. It will delve into various aspects of cyber threat intelligence, including data collection methods, threat actor profiling, threat detection and analysis techniques, and the use of machine learning for automated threat intelligence.
Mandatory traineeship	6
Company cofinancing	Cy4Gate S.p.A.

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Ex DM 117/2023
Project title	Improving SME Business Processes with a focus on Cybersecurity
Supervisor	Mauro Conti
Supervisor Email	mauro.conti@unipd.it
Project description	While companies always strive for optimization of their administrative and industrial processes, security and privacy should not be underestimated. The aim of this project is to propose novel techniques to improve the security of business and industrial processes, particularly for Small and Medium Enterprises, including the ones involving Industrial Control Systems (ICS), while preserving data confidentiality and protecting assets from cyber-attacks.
Mandatory traineeship	6
Company cofinancing	UNINDUSTRIA SERVIZI & FORMAZIONE TREVISO PORDENONE SCARL

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Ex DM 117/2023
Project title	Study and design of novel solutions for open source intelligence
Supervisor	Mauro Conti
Supervisor Email	mauro.conti@unipd.it
Project description	Modern investigation techniques heavily rely on collecting data with automatic tools. The goal of this project is to propose novel techniques and tools to automatize and efficiently retrieve, interact and present data related to a given subject (a person, an organization, a discussion topic, etc), possibly making use of NLP techniques, analysis of data from Internet and Social Media in particular, as well as information inference across different domains.
Mandatory traineeship	6
Company cofinancing	Axerta S.p.A.

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Ex DM 117/2023
Project title	Design and evaluation of novel technologies and paradigms for digital trust
Supervisor	Mauro Conti
Supervisor Email	mauro.conti@unipd.it
Project description	The objective of this research project is to design and evaluate cutting-edge technologies and paradigms to enhance digital trust. The project focuses on exploring innovative approaches to address the challenges associated with security, privacy, and trustworthiness in the digital landscape. The project might involve development of advanced authentication mechanisms, secure data sharing frameworks, trust assessment solutions.
Mandatory traineeship	6
Company cofinancing	InfoCert S.p.A. Società Soggetta alla Direzione ed al Coordinamento di Tinexta S.p.A.

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Ex DM 117/2023
Project title	AI-powered cybersecurity approaches and solutions
Supervisor	Mauro Conti
Supervisor Email	mauro.conti@unipd.it
Project description	This project aims to explore the application of artificial intelligence (AI) in the field of cybersecurity. The project focuses on developing and evaluating AI-powered approaches and solutions to enhance the effectiveness and efficiency of cybersecurity measures. The aim of this project is to investigate various aspects of AI in cybersecurity, such as application of AI for cybersecurity solutions (e.g., for anomaly detection, behavioral analysis, threat intelligence, and automated incident response), as well as adversarial machine learning issues (e.g., backdoors, and membership inference).
Mandatory traineeship	6
Company cofinancing	Siemens AG

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Ex DM 117/2023
Project title	Cybersecurity challenges in the industrial metaverse
Supervisor	Mauro Conti
Supervisor Email	mauro.conti@unipd.it
Project description	<p>The industrial metaverse refers to the integration of virtual and augmented reality technologies within industrial settings, enabling enhanced collaboration, remote operations, and data-driven decision-making.</p> <p>The project seeks to design novel solutions for secure and resilient operation of industrial systems in the metaverse, fostering trust and confidence in this emerging technological landscape.</p>
Mandatory traineeship	6
Company cofinancing	Siemens Corporation Technology

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Computer Science for Societal Challenges and Innovation
Type of scholarship	Ex DM 117/2023
Project title	Study of the application of European and international standards on cybersecurity requirements related to electrical and electronic equipment
Supervisor	Mauro Conti
Supervisor Email	mauro.conti@unipd.it
Project description	This research project aims to examine the implementation and impact of European and international standards concerning cybersecurity requirements for electrical and electronic equipment. The goal is to design solutions and tools to efficiently and effectively automatize the compliance to those requirements.
Mandatory traineeship	6
Company cofinancing	DEKRA Testing and Certification S.r.l.

PhD Programme	BRAIN, MIND AND COMPUTER SCIENCE
Curriculum (if foreseen)	Neuroscience, Technology, and Society
Type of scholarship	Ex DM 117/2023
Project title	Development and validation of a bioimpedance-based technology for muscle glycogen assessment – GLYCOLAB project
Supervisor	Antonio Paoli
Supervisor Email	antonio.paoli@unipd.it
Project description	<p>Muscle glycogen amount evaluation is a fundamental resource in different health's related fields but especially in sport science. Indeed, in sport science, muscle glycogen evaluation allow to adapt training program and nutrition to athletes' condition.</p> <p>The aim of the project is to create an algorithm able to estimate the amount of muscle glycogen on the basis of data given by an bioimpedance analyzer (resistance and reactance). To elaborate the algorithm we will evaluate the amount of muscle glycogen directly through muscle biopsies and compare to bioimpedance data. We will match direct measurements with resistance and reactance values and possibly with other physiological data to obtain a predictive formula.</p>
Mandatory traineeship	6
Company cofinancing	Akern Srl

PhD Programme	CROP SCIENCE
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	GMO-free approaches: double stranded RNAs for sustainable grapevine protection
Supervisor	Claudio Bonghi
Supervisor Email	claudio.bonghi@unipd.it
Project description	The PhD project will apply GMO-free biotechnological approaches using beneficial microbes and double stranded RNAs (dsRNAs) molecules to improve sustainability and resilience in the vineyard ecosystem following PNRR spoke 2 activities. During the PhD project, target fungal genes will be selected for dsRNAs production and application in grapevine tissues. In parallel, microbiological resources already available at CREA-VE will be exploited to build synthetic microbial communities able to protect grape plants against trunk pathogens. Both, dsRNAs and microbial inocula will be studied for the possibilities to prime grape plants against the main biotic and abiotic stresses. The final goal will be to reduce the environmental inputs improving water use efficiency and defence responses. The activities will be mainly performed at CREA-VE, Conegliano, under the supervision of the co-tutor Dr. Walter Chitarra and Dr. Luca Nerva.
Mandatory traineeship	6
Company cofinancing	VCR – Vivai Cooperativi Rauscedo

PhD Programme	CROP SCIENCE
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Identification of peptides and proteins for the control of grapevine Flavescence dorée and their application in planta
Supervisor	Rita Musetti
Supervisor Email	rita.musetti@unipd.it
Project description	Grapevine Flavescence dorée (FD) is a destructive phytoplasma-associated disease. FD management relies on rouging of infected plants and replanting of pathogen-free grapevines, as well as on the containment of the vector population with insecticide treatments. Nowadays, sustainable practices for crop protection represent one of the most urgent challenges in viticulture. Antimicrobial peptides are promising sustainable tool to control phytoplasmas, due to their unique mechanism of action, broad spectrum of activity, and low environmental impact. Moreover, moving towards a more sustainable agriculture, knowledge of the complex mechanisms that underlie plant-pathogen relationships is required. The identification of candidate genes involved in plant resistance is therefore a great aid in the development of management tools for FD control and will help to reduce both the economic damages and the insecticide treatments worldwide.
Mandatory traineeship	6
Company cofinancing	AMPELOS Italia - Consorzio Italiano Vivaisti Viticoli

PhD Programme	FUSION SCIENCE AND ENGINEERING
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	The role of fusion in future energy carbon-free scenarios
Supervisor	Giuseppe Zollino
Supervisor Email	giuseppe.zollino@unipd.it
Project description	In the pathway towards EU economy decarbonization, nuclear technologies will cover a crucial role together with renewables and energy storage technologies. Nuclear power plants, thanks to their high capacity factor, can provide stable and continuous carbon-free electricity to cope with the increasing electrification of the energy sectors, enhancing security of electricity supply. Nuclear fusion offers the opportunity of generating electricity through inherently-safe fusion reactions and with limited low-activated material production; in particular no high level radioactive waste will be produced. The doctoral research is aimed at studying nuclear fusion as part of a future carbon-free energy system for the identification of benefits and hurdles of the technology deployment for a smooth integration with renewables. Energy scenarios will be developed and the studies will cover a variety of topics, ranging from economy, energy policy, climate policy, energy technologies development.
Mandatory traineeship	6
Company cofinancing	Eni SpA

PhD Programme	FUSION SCIENCE AND ENGINEERING
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Development of Machine Learning methods to detect and solve failures in plasma diagnostics
Supervisor	Lidia Piron
Supervisor Email	lidia.piron@unipd.it
Project description	<p>In the next years, the DTT device will contribute on identifying reliable and robust solutions for the power load and particle exhaust.</p> <p>To control the plasma dynamics and to monitor the plasma performance, DTT will be equipped with a wide range of diagnostics. To guarantee robust and reliable DTT operations, it is of paramount importance that the signals are reliable, especially the ones exploited for real-time machine protection. However, possible failure of signals can occur.</p> <p>To overcome this problem, a brand-new solution, which will be investigated in this PhD work, consists in the use of Machine Learning (ML). Once trained in a widespread operational database, ML methods will i) enable real-time health monitoring of the signals, with discrepancies between the learnt and actual responses highlighting an early indication of sensor failure and ii) will solve failure in diagnostics, supplementing missing data.</p>
Mandatory traineeship	6
Company cofinancing	ENI SpA

PhD Programme	FUSION SCIENCE AND ENGINEERING
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Modelling and development of controllers for DTT
Supervisor	Lidia Piron
Supervisor Email	lidia.piron@unipd.it
Project description	In the next years, the DTT device will contribute on identifying reliable and robust solutions for the power load and particle exhaust in a reactor. To guarantee a successfully DTT operation, beside machine integrity, the plasma dynamic will be monitored in real-time by the plasma control system (PCS). The PCS will orchestrate the outputs from several diagnostics and will send actions to plasma actuators to tailor the plasma behavior and to regulate the proximity of the operation point to critical boundaries. Within this PhD project, the candidate will develop physics- and model-based Matlab Simulink controllers for DTT PCS.
Mandatory traineeship	6
Company cofinancing	DTT S.c. a r.l.

PhD Programme	FUSION SCIENCE AND ENGINEERING
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Analysis and development of a numerical code to simulate the behaviour of a high-frequency solid-state power amplifier for ICH systems
Supervisor	Paolo Bettini
Supervisor Email	paolo.bettini@unipd.it
Project description	<p>Several controlled nuclear fusion experiments have been operated worldwide in the last decades, and a few (e.g., DTT and SPARC) are going to be built to support the first demonstration fusion reactors. Both DTT and SPARC need a significant amount of additional heating that will be provided to a smaller or larger extent by an Ion Cyclotron Heating (ICH) system, able to inject electromagnetic waves into the plasma at the cyclotron frequency of the ion species.</p> <p>The aim of this PhD research is to develop a predictive model of high-power, solid-state RF amplifiers so as to simulate their behaviour in the real operational conditions as to Voltage Standing Wave Ratio (VSWR) and its rapid changes. The study resulting from this modeling would allow to fill the gap due to the missing direct experience of such systems on fusion plasmas, and could be used in the design of machines such as SPARC, ARC and DTT.</p>
Mandatory traineeship	6
Company cofinancing	Eni SpA

PhD Programme	FUSION SCIENCE AND ENGINEERING
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Development of the injector for the DTT Neutral Beam Injection system
Supervisor	Paolo Bettini
Supervisor Email	paolo.bettini@unipd.it
Project description	The main purpose of the Divertor Tokamak Test facility (DTT) is to study solutions to mitigate the issue of power exhaust in reactor relevant conditions. In this context, the principal objective of DTT is to mitigate the risk of a difficult extrapolation to a fusion reactor of the conventional divertor based on detached conditions, which will be tested in ITER. The key feature is to equip the machine with a significant amount of auxiliary heating power to test innovative divertor concepts. The goal of this PhD work is to optimize the design of the main components of the beamline for DTT NBI and give support to the work team during the conceptual design and engineering design phases. The candidate will be trained on the usage of the necessary simulation codes by the design team and followed during the development of the design solutions.
Mandatory traineeship	6
Company cofinancing	DTT S.c. a r.l.

PhD Programme	GEOSCIENCES
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Understanding and numerical modelling of the triggering mechanisms of induced earthquakes in medium and high enthalpy geothermal power plants
Supervisor	Giorgio Cassiani
Supervisor Email	giorgio.cassiani@unipd.it
Project description	The project aims at improving the predictability of induced/triggered seismicity associated to geothermal deep projects, as this side effect can raise substantial concern and public opposition. The PhD candidate will be involved in modelling activities linking the fluid-dynamic/geothermal behavior of deep geothermal reservoirs to the associated geo-mechanical behavior of fault systems. In particular, the modelling of fault stability will be put at the center of the investigation. The usually applied Mohr-Coulomb response shall be refined given the state of pressure and temperature of deep reservoirs, and the production of heat as a result of initial slipping. In addition, strong uncertainties linked to the existing state of stress need to be resolved or at least knowledge about this key factor improved. The research will be conducted using full 3D modelling tools, and actual case studies will be analyzed, also with the support of seismicity monitoring data.
Mandatory traineeship	12
Company cofinancing	ISAMGEO Italia S.r.l.

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Chemical and Environmental Engineering
Type of scholarship	Ex DM 117/2023
Project title	Safe by design wood coatings
Supervisor	Alessandra Lorenzetti
Supervisor Email	alessandra.lorenzetti@unipd.it
Project description	Wood coatings are widely used to protect the surface from water, sun, grease, dust and household chemicals. The growing awareness of user health issues makes it attractive to explore the development of coatings that are safe “by design”. For these reasons, this project aims to create 2K paints that do not contain products with specific safety issues. In particular, it will first be necessary to synthesize in the laboratory polymers containing functional groups capable of reacting with crosslinking systems. The cross-linking reactions must take place easily at room temperature while still guaranteeing a sufficiently long pot-life. The coating obtained must have performance comparable to those of their market counterparts. The best systems obtained in the laboratory will then be tested in the company to evaluate their industrial scalability.
Mandatory traineeship	6
Company cofinancing	Renner Italia S.p.A.

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Chemical and Environmental Engineering
Type of scholarship	Ex DM 117/2023
Project title	Optimization of industrial scale fermentation processes in the pharmaceutical industry: experiments and modeling
Supervisor	Eleonora Sforza
Supervisor Email	eleonora.sforza@unipd.it
Project description	The research project is focused on the optimization of the production process of compounds for the pharmaceutical industry (such as antibiotics), obtainable by bacterial fermentation. Both laboratory activities and kinetic modeling of the process are foreseen. The laboratory activities will be focused on the study of the operating conditions that maximize the growth and yield of the target product, by manipulating the operating variables such as temperature, pressure, growth medium and cultivation methods. These experiments, conducted on a small scale, will produce quantitative data that will be used for the modeling part. The modeling activities will examine the models already present in the literature, which will be adapted to the specific process and validated with further laboratory data. Based on the results obtained from the experimentation, industrial-scale validation tests will be carried out at the company.
Mandatory traineeship	6
Company cofinancing	SUANFARMA Italia S.p.A.

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Chemical and Environmental Engineering
Type of scholarship	Ex DM 117/2023
Project title	Halophilic algae for fatty acids industrial production
Supervisor	Eleonora Sforza
Supervisor Email	eleonora.sforza@unipd.it
Project description	The research project is focused on the development of an innovative system for the cultivation of alkali-halophilic algae, aimed at the production of biomass for aquaculture. The research activities include both laboratory activities and kinetic modeling of the process. The experimental part is aimed at the selection and characterization of saltwater species that grow efficiently in the technology proposed by the company. The focus is also to identify the operating conditions that most stimulate the production of lipids. These experiments, conducted on a small scale, will produce quantitative data that will be used for the modeling part. The modeling activities will be aimed at describing the consumption of nutrients and inorganic carbon by the algal biomass. On the basis of the results obtained from the experimentation, validation tests will be carried out on a pilot scale at the company.
Mandatory traineeship	6
Company cofinancing	Algaflag Srl

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Chemical and Environmental Engineering
Type of scholarship	Ex DM 117/2023
Project title	3D bioprinting of tissue substitutes for biomedical applications
Supervisor	Elisa Cimetta
Supervisor Email	elisa.cimetta@unipd.it
Project description	<p>The ever-growing need for improved in vitro models of human tissues to study both healthy and diseased states is advancing the use of techniques such as 3D Bioprinting.</p> <p>3D cultures and cell-laden hydrogel constructs enable the creation of more physiologically relevant models and providing specific mechanical cues to control cell fate and function. The ability to recapitulate the in vivo environment using 3D bioprinting is key for studies on the complexity of native tissues, which are strongly limited if conducted on 2D or scaffold-free 3D cultures. The main goal of the proposed project is thus to produce clinically relevant tissue constructs, which must be more organized and significantly thicker than the few hundred micrometers where diffusion is sufficient to deliver nutrients to cells. This will thus also require strategies (ie. perfusion) to guarantee a constant provision of factors to all cells, including those in the bulk.</p>
Mandatory traineeship	6
Company cofinancing	Bio System Lab Srl

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Chemical and Environmental Engineering
Type of scholarship	Ex DM 117/2023
Project title	Ecosystems for Green Fuels production
Supervisor	Fabrizio Bezzo
Supervisor Email	fabrizio.bezzo@unipd.it
Project description	The project aims at developing and assessing process flowsheets for green fuels production, taking into account available technologies for carbon capture and utilization, green hydrogen production as well as the potential electrification of thermal utilities in critical unit operations. Fuels of strategic interests (e.g., methane, methanol, sustainable aviation fuels – SAF) will be taken as reference for the process modeling & development and design tasks, which will be optimized to maximize economic performance and to minimize the environmental impact, considering European Union directives and the current evolution of the technological context.
Mandatory traineeship	12
Company cofinancing	INCICO SpA

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Chemical and Environmental Engineering
Type of scholarship	Ex DM 117/2023
Project title	Model-based approaches to accelerate the development and scale-up of API downstream manufacturing processes
Supervisor	Fabrizio Bezzo
Supervisor Email	fabrizio.bezzo@unipd.it
Project description	The project aims at investigating and implementing new model-based approaches to streamline development, scale-up and optimization of APIs manufacturing processes, with focus on downstream unit operations such as crystallization, filtration and drying. The project objective is to build a workflow that the company can apply to quickly develop and transfer optimized downstream processes so as to ensure successful production and desired product quality as well as to reduce production scraps and needs for reworking. The methodology will focus on the crystallization, filtration and drying steps according to flowsheet mode, where the outputs from previous steps affect subsequent operation performances and outputs. Model-based design of experiments, machine learning, optimization techniques will be employed to achieve the project goals.
Mandatory traineeship	6
Company cofinancing	F.I.S. - Fabbrica Italiana Sintetici S.p.A.

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Electrical Engineering
Type of scholarship	Ex DM 117/2023
Project title	High temperature insulation for electrical machines
Supervisor	Enrico Bernardo
Supervisor Email	enrico.bernardo@unipd.it
Project description	<p>In some applications, the working environment of electric machines is particularly hotter than under normal operating conditions. The temperature can reach 350°C therefore the insulation must be able to withstand temperatures of around 450°C. For these applications inorganic insulators will be considered which, however, do exhibit an intrinsic weakness.</p> <p>The goal of the research is to find an inorganic insulator capable of maintaining the characteristics even at very high temperatures, starting from a pre-ceramic composite.</p> <p>Photosensitive resins will be added which can guarantee cross-linking when subjected to UV radiation, keeping the insulation flexible before a subsequent one ceramization process.</p> <p>Tests will be carried out on small samples. A full wrap will be done below. Electrical and thermal tests will be carried out to verify both the degree of insulation than the thermal capacity.</p>
Mandatory traineeship	6
Company cofinancing	De Angeli Prodotti S.r.l.

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Electrical Engineering
Type of scholarship	Ex DM 117/2023
Project title	Digital Twins for control and monitoring of electric components
Supervisor	Fabrizio Dughiero
Supervisor Email	fabrizio.dughiero@unipd.it
Project description	The industrial sector's shift to electrification is vital for reducing CO2 emissions. Real-time monitoring, control systems, and predictive analysis are crucial for efficiency and safety. Inability to monitor critical quantities in real-time leads to inefficiencies, redundancies, and certification difficulties. Digital Twins (DTs) offer a solution as adaptive digital replicas for monitoring and predicting quantities. Cloud-based DTs face communication delays, but on-chip DTs embedded in hardware overcome this. Implementing on-chip DTs for accurate monitoring and prediction is a challenging task, integrating engineering modelling, scientific computing, and control. This project aims to develop, validate, and demonstrate the benefits of on-chip DTs through embedded software prototypes.
Mandatory traineeship	6
Company cofinancing	Newtven (Hexadrive Engineering Srl)

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Electrical Engineering
Type of scholarship	Ex DM 117/2023
Project title	Long duration electrochemical energy storage
Supervisor	Massimo Guarnieri
Supervisor Email	massimo.guarnieri@unipd.it
Project description	Long duration energy storage (LDES) is emerging as strategic need for future grids. Closed batteries (lithium, sodium, ...) present issues e.g. life duration, safety and self-discharge. Hydrogen storage promises to cope with long term storage, but it is prone to efficiency issues. In this framework, redox flow batteries (RFBs) are emerging as a competitive option. By storing energy in liquid electrolytes held in tanks outside the reactor, they provide independent sizing of energy and power, thus allowing for long discharge times which are inaccessible for closed batteries. Their most developed version, the vanadium RFB, exhibits very long life, virtually no self-discharge, operation at room temperature and pressure and absence of hazard risks. But more technological and engineering research is required to improve their performance and competitiveness.
Mandatory traineeship	6
Company cofinancing	Eni SpA

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Electrical Engineering
Type of scholarship	Ex DM 117/2023
Project title	Integration of numerical methodologies with machine learning techniques for design optimisation of high-efficiency synchronous machines in industrial generation/cogeneration and energy storage applications
Supervisor	Mauro Andriollo
Supervisor Email	mauro.andriollo@unipd.it
Project description	This research project aims to integrate machine learning techniques with the various design methodologies of electrical machines, starting with established analytical methods, moving through numerical techniques based on magnetic and thermal networks, which are relatively more accurate although of more circumscribed application, to more sophisticated ones such as finite element analysis. The computational procedures developed using this approach can then be refined by comparison with experimental findings made during testing on existing machines. The ultimate goal is to realize an integrated and continuously upgradable framework for design optimization of medium-power synchronous generators for industrial generation, cogeneration and energy storage applications, with the aim of increasing their efficiency and performance.
Mandatory traineeship	6
Company cofinancing	Marelli Motori Srl

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Electrical Engineering
Type of scholarship	Ex DM 117/2023
Project title	Analysis of synchronous reluctance motor for refrigeration systems
Supervisor	Nicola Bianchi
Supervisor Email	nicola.bianchi@unipd.it
Project description	<p>The activity will focus on the study of an electric motor for an industrial refrigeration compressor, with a power of a few hundred kW. The motor will be of the synchronous type and in particular a synchronous reluctance motor will be studied, possibly assisted by ferrite magnets. A comparison between the motors currently used (PM and induction motors) and the synchronous reluctance motor will be included in this study. This will help to define the technical specifications. The motor will be inserted inside the compressor, i.e. it will be directly cooled by the coolant itself. The activity includes the design of the motor, the electromagnetic analysis, the thermal analysis, the determination of electromagnetic parameters and characteristics. MTPA and FW trajectories will be identified for implementation in the control system. Several control strategies will be discussed and compared. A prototype will be made and measurements will be carried out to validate the model.</p>
Mandatory traineeship	6
Company cofinancing	Daikin Applied Europe Spa

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Electrical Engineering
Type of scholarship	Ex DM 117/2023
Project title	Project of electric motors and their controls for light vehicle and off-highway applications in low voltage domain ($V \leq 120V$) with sensorless techniques
Supervisor	Nicola Bianchi
Supervisor Email	nicola.bianchi@unipd.it
Project description	The research activity includes the design of anisotropic synchronous motors without rare earths and the control of such anisotropic synchronous motors taking into account the characteristics of the alternative magnetic materials used (residual flux density, coercive field, possible demagnetization, and variation with temperature). The research will also include the design and control of multiphase motors and in particular multi-three-phase motors. The control of synchronous motors will use speed control based on sensorless algorithms.
Mandatory traineeship	6
Company cofinancing	DANA TM4 Italia S.r.l.

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Energy Engineering
Type of scholarship	Ex DM 117/2023
Project title	Development of hydraulic power units for the energy industry through life cycle assessment and energy performance optimization
Supervisor	Alberto Benato
Supervisor Email	alberto.benato@unipd.it
Project description	<p>Efficient and sustainable hydraulic systems are essential for the exploitation of renewable sources. Therefore, components and power plants require continuous improvements in terms of both energy performance and environmental compatibility.</p> <p>To this end, the research project, focused on hydraulic power plants for the movement of solar trackers and wind and hydraulic turbine blades, aims to:</p> <ul style="list-style-type: none"> - Analyze plant components and layouts to build mathematical models capable of predicting their dynamic behavior and evaluating their entire life cycle. - Experimentally measure the energy performance to calibrate the mathematical models. <p>Then, the development of more energy and environmentally efficient components and layouts will be carried out through fluid dynamics and energy optimization procedures as well as life cycle analysis.</p> <p>The developed components and control units will be experimentally tested to evaluate the real improvements.</p>
Mandatory traineeship	12
Company cofinancing	Hydroven Srl

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Energy Engineering
Type of scholarship	Ex DM 117/2023
Project title	Numerical simulation of two-phase heat transfer with CFD codes
Supervisor	Davide Del Col
Supervisor Email	davide.delcol@unipd.it
Project description	The PhD student will study the heat exchange during condensation and during vaporization using the OpenFOAM code. This study presents significant challenges especially related to the determination of the liquid-vapour interface in various flow regimes.
Mandatory traineeship	6
Company cofinancing	Onda SpA

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Energy Engineering
Type of scholarship	Ex DM 117/2023
Project title	Advanced methods and control of defrosting in heat pumps
Supervisor	Davide Del Col
Supervisor Email	davide.delcol@unipd.it
Project description	It is aimed at studying frost formation and methods for surface defrosting, including treatments for modifying surface wettability. The final objective to be achieved, through advanced defrosting methods and appropriate control, is energy saving in air source heat pumps.
Mandatory traineeship	6
Company cofinancing	Swegon Operations S.r.l.

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Materials Engineering
Type of scholarship	Ex DM 117/2023
Project title	Upcycling of polypropylene from the urban waste collection into a new generation of high-performance compounds through the development of an advanced production system
Supervisor	Giovanni Lucchetta
Supervisor Email	giovanni.lucchetta@unipd.it
Project description	The project aims to develop a variant of the injection molding process that allows the molding of compounds containing high percentages of recycled polypropylene from flexible films from municipal waste collection. As the recyclate content increases, there are reductions in the mechanical performance of the molded part, increased surface defects and odor emissions. In the project, process technologies will be developed to reduce the incidence of surface defects and mold contamination through the use of mold cavity pressurization and supercritical gas stripping technologies carried out during plasticization. The design of such systems will be done using state-of-the-art methods: from the complete characterization of polymeric compounds, to the use of software to simulate the molding process, to the qualitative verification of the manufactured components.
Mandatory traineeship	6
Company cofinancing	Sirmax S.p.A.

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Materials Engineering
Type of scholarship	Ex DM 117/2023
Project title	Sustainable machining operations applied to added-value metallic and non-metallic materials
Supervisor	Stefania Bruschi
Supervisor Email	stefania.bruschi@unipd.it
Project description	The project foresees the design and implementation of sustainable machining operations carried out on metallic and polymeric materials, the latter also reinforced. The objective is the reduction in the use of conventional cutting fluids, potentially harmful, in favour of more sustainable solutions, anyway capable to guarantee the quality of the machining operation. Different approaches will be evaluated, including dry cutting, Minimum Quantity Lubrication regimes, and cooling through the use of cryogenic fluids.
Mandatory traineeship	6
Company cofinancing	FATIGROUP Srl

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Materials Engineering
Type of scholarship	Ex DM 117/2023
Project title	New generation of cutting tools to enhance the performances of machining and deburring operations on nickel-based superalloys aerospace parts
Supervisor	Stefania Bruschi
Supervisor Email	stefania.bruschi@unipd.it
Project description	The project foresees the evaluation of the performances of a new generation of tools to be used in machining and deburring operations carried out on aerospace parts made of nickel-based superalloys. The performances of these tools will be evaluated in terms of tool wear and surface integrity of the component, the latter declined in terms of surface finish, residual stresses and microstructure of the sub-surface. Tools made of material other than the ones currently used in the industrial practice will be evaluated.
Mandatory traineeship	6
Company cofinancing	FLY S.p.A.

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Mechanical Engineering
Type of scholarship	Ex DM 117/2023
Project title	Adaptive systems for advanced manufacturing of welded tubes in metallic materials
Supervisor	Andrea Ghiotti
Supervisor Email	andrea.ghiotti@unipd.it
Project description	The aim of the project is the study of tubes profiling lines for the development and implementation of adaptive systems for process automation. The research will concern the definition of the approaches and methods for tube profiling, the mechanical design of the main structural parts of the line, the definition of approaches and methodologies for process monitoring and control, as well as the choice of the automations for the control of the main process parameters. The activity will have to lead to the definition of a digital twin model capable of allowing the optimization and improvement of the quality of the components produced, as well as flexible management of the small production batches.
Mandatory traineeship	6
Company cofinancing	CSM Tube SpA

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Mechanical Engineering
Type of scholarship	Scholarship funded by Dipartimento di Ingegneria Industriale
Project title	Methods for manufacturing process improvement using digital twins of coordinate measuring systems
Supervisor	Enrico Savio
Supervisor Email	enrico.savio@unipd.it
Project description	The main objective of the project is to develop a methodology for evaluating the metrological performance of measurements made in manufacturing production settings using coordinate measurement systems.
Mandatory traineeship	n.a.
Company cofinancing	Dipartimento di Ingegneria Industriale

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Mechanical Engineering
Type of scholarship	Ex DM 117/2023
Project title	Physical foaming of sustainable thermoplastic elastomers
Supervisor	Marco Sorgato
Supervisor Email	marco.sorgato@unipd.it
Project description	The project aims to design systems for molding components in extremely low-density foamed thermoplastic material for the footwear sector. Using sustainable thermoplastic elastomers within the production chain will require careful material characterization from a chemical, rheological, and mechanical standpoint. Furthermore, the effect of such materials on the robustness of the physical foaming process will be evaluated, which must be designed to accommodate any fluctuations in the chemical or rheological properties of the materials considered. Such systems will be developed using state-of-the-art techniques and methodologies, ranging from the comprehensive characterization of thermoplastic elastomers to finite element software to simulate the physical foaming process and, ultimately, to the performance and quality verification of the manufactured components.
Mandatory traineeship	6
Company cofinancing	Main Group Technologies S.r.l.

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Mechanical Engineering
Type of scholarship	Scholarship funded by Dipartimento di Ingegneria Industriale
Project title	Development of methods for the functional and structural optimized design of prosthetic components for sport and daily life activities
Supervisor	Nicola Petrone
Supervisor Email	nicola.petrone@unipd.it
Project description	For people with lower limb amputations, quality of life depends on the availability of prosthetic systems optimized for functionality, safety, comfort and performance. Access to recreational and competitive sports is a fundamental vehicle for post-traumatic rehabilitation and a powerful push towards social inclusion. At the moment, state-of-the-art technologies and in particular those shared between INAIL and UniPD in track and test bench installations allow a broad and in-depth evaluation of the in-vivo and in-vitro performance of prosthetic components such as foot, knee and socket and their bench simulation for functional and structural characterizations. The PhD involves the development, prototyping and testing of new optimized solutions of components such as foot and socket for the improvement of comfort, performance and safety in sports practice and consequently for the transfer to devices for everyday life.
Mandatory traineeship	n.a.
Company cofinancing	Dipartimento di Ingegneria Industriale

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Mechanical Engineering
Type of scholarship	Scholarship funded by Dipartimento di Ingegneria Industriale
Project title	Digital transformation of the design and manufacturing process of prosthetic components for sport and daily life activities
Supervisor	Nicola Petrone
Supervisor Email	nicola.petrone@unipd.it
Project description	Lower limb prostheses are medical devices fabricated to support patients with amputation during daily life activities and, for the athletes, during sport competitions. Among the elements of a lower limb prosthesis, the socket is custom-made by Certified Prosthetists (CPs), with a multi-step iterative manual process. Currently, socket manufacturing workflow has two main limitations: it is heavily operator dependent and there are no widely accepted guidelines for socket testing, resulting in a gap in the mechanical properties knowledge. Therefore, this project aims to develop a software to help the CPs in the design and manufacturing of custom-made socket for sport and daily life activities. This tool should embed an unsupervised machine learning algorithm capable to learn and apply the typical modifications manually performed by technicians. Moreover, this research project aims to design and manufacture a mock limb for socket testing, trying to fill one of the literature gaps.
Mandatory traineeship	n.a.
Company cofinancing	Dipartimento di Ingegneria Industriale

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Mechanical Engineering
Type of scholarship	Ex DM 117/2023
Project title	Two-wheeled vehicles for a sustainable and safe mobility
Supervisor	Roberto Lot
Supervisor Email	roberto.lot@unipd.it
Project description	<p>The objectives of the PNRR include the development of more sustainable local transport (reduction of air and noise pollution, reduction of congestion). In this area, electric motorcycles and pedal-assisted bicycles are advantageous compared to cars thanks to their much smaller size and needs. However, two-wheelers are the most exposed to road accidents, recording almost 1,000 victims in 2021 alone.</p> <p>This project focuses on the software and hardware development of a safety system that monitors the user's driving style, recognizes any critical issues and suggests safer behaviour. Software tools for improving the stability and safety of electric two-wheelers will be developed too.</p>
Mandatory traineeship	12
Company cofinancing	Dynamotion Srl

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Mechanical Engineering
Type of scholarship	Ex DM 117/2023
Project title	Innovative electric three-wheeled vehicles for a sustainable and safe mobility
Supervisor	Roberto Lot
Supervisor Email	roberto.lot@unipd.it
Project description	<p>The project aims to develop an innovative three-wheeled, light duty, electric vehicle.</p> <p>An entirely new architecture for the chassis (chassis type, suspensions archetype and geometry, wheel size, mass distribution, modularity, components and systems layout) and the powertrain (layout, motor type and size, battery type and size) will be developed, a prototype will be built in the Stellantis facilities.</p> <p>Safety and sustainability will be enhanced through the development of ADAS specific for this class of vehicles. Regarding safety, an Anti-Rollover Assistant system, which predicts the rollover and control the vehicle to mitigate the problem, will be developed. Regarding sustainability, an Efficient Driving Assistant that reduces energy demand while taking into account driver's preferences will be developed.</p> <p>A significant part of the activities will be carried out at the Stellantis facilities in Italy and abroad.</p>
Mandatory traineeship	6
Company cofinancing	Stellantis / Centro Ricerche Fiat

PhD Programme	INDUSTRIAL ENGINEERING
Curriculum (if foreseen)	Mechanical Engineering
Type of scholarship	Ex DM 117/2023
Project title	Development of methods for ergonomic optimization in the handling of parcels
Supervisor	Silvio Cocuzza
Supervisor Email	silvio.cocuzza@unipd.it
Project description	The manual handling of heavy and/or voluminous parcels in logistics or in production can cause accidents and professional diseases to operators. In this project, on the one hand we want to study the movements actually performed by the operator in different operating scenarios and compare them with the optimal movements from an ergonomic point of view; on the other hand, we want to develop a continuous monitoring system that can warn the operator that he/she is making non-ergonomic movements and suggest him/her the optimal movements and handling strategy.
Mandatory traineeship	12
Company cofinancing	DECATHLON ITALIA S.r.l. Unipersonale

Place not available: the financing is not confirmed

PhD Programme	INGEGNERIA DELL'INFORMAZIONE
Curriculum (if foreseen)	Scienza e Tecnologia dell'Informazione
Type of scholarship	Ex DM 117/2023
Project title	Design of autonomous racing algorithm for electric vehicles
Supervisor	Alessandro Beghi
Supervisor Email	alessandro.beghi@unipd.it
Project description	The design of autonomous driving algorithms for electric vehicles aims to ensure vehicle stability and maximize the benefits of electric propulsion. Vehicle stability is a key element in the design of autonomous driving algorithms. Algorithms must take into account the specific characteristics of electric propulsion, such as weight distribution and instantaneous torque of electric motors, to ensure safe and stable driving. The use of innovative algorithms, such as torque vectoring control, allows the power distribution on individual motors to be dynamically adapted to improve vehicle traction and handling. In addition, the interaction between electric propulsion and autonomous driving algorithms opens up new possibilities for optimizing energy efficiency. The ultimate goal is to create autonomous driving algorithms that maximize the stability and efficiency of electric vehicles.
Mandatory traineeship	6
Company cofinancing	Michelotto Engineering S.p.A.

PhD Programme	INGEGNERIA DELL'INFORMAZIONE
Curriculum (if foreseen)	Scienza e Tecnologia dell'Informazione
Type of scholarship	Ex DM 117/2023
Project title	Underwater communication and positioning systems
Supervisor	Filippo Campagnaro
Supervisor Email	filippo.campagnaro@unipd.it
Project description	The project will focus on the analysis of innovative underwater acoustic communications and positioning systems. After understanding all software and hardware components needed to create an underwater acoustic modem, different modulation, forward error correction and media access control (MAC) techniques will be analyzed, developed and evaluated both in a simulated environment and in sea experiments. Given the challenges of the underwater acoustic channel, including frequency-dependent noise, large propagation delay, multipath and Doppler, MAC and modulation schemes used in terrestrial wireless communication are usually not effective. For this reason, frequency hopping (e.g., the JANUS NATO standard) and spread spectrum (e.g., S2C) techniques are often used to modulate the signal, and MAC schemes that leverage on spatial-reuse and near-far effects are employed. The candidate will evaluate these techniques and propose innovative solutions for new generation underwater acoustic networks.
Mandatory traineeship	12
Company cofinancing	EvoLogics GmbH

PhD Programme	INGEGNERIA DELL'INFORMAZIONE
Curriculum (if foreseen)	Scienza e Tecnologia dell'Informazione
Type of scholarship	Ex DM 117/2023
Project title	Control Systems design and remote thermal management of smart building via open-source ICT platforms
Supervisor	Luca Schenato
Supervisor Email	l.schenato@unipd.it
Project description	Buildings account for more than 30% of total final energy consumption and CO2 emissions for all sectors of the economy. The particularity of the building sector as a contributor of greenhouse gases is that it not only causes global warming but puts the objectives of the European Energy Roadmap 2050 at risk. Ongoing activities to reduce energy consumption and CO2 emissions from buildings focus on technologies which fail to incorporate energy saving potential through appropriate integration and cooperation between its occupants and thermal management systems. The innovative ideas of this project are i) the inclusion of real-time information of the comfort perceived by the building users in the thermal management, ii) the optimization of the working points of the new generation HVAC systems, iii) the use of open-source platforms to be able to create modular management systems that are independent from the hardware and sensors used.
Mandatory traineeship	6
Company cofinancing	Edilvi S.p.A.

PhD Programme	INGEGNERIA DELL'INFORMAZIONE
Curriculum (if foreseen)	Scienza e Tecnologia dell'Informazione
Type of scholarship	Ex DM 117/2023
Project title	Innovative Architectures for Low-Power IoT Devices
Supervisor	Michele Zorzi
Supervisor Email	michele.zorzi@unipd.it
Project description	<p>During the project the candidate will study and design innovative wireless communications techniques for low power Internet of Things wide area networks (LP-WANs), in the context of the sixth generation mobile system standard (6G). In this study it is planned to carry out support for data transmission, implementing new algorithms and new protocols for reliable and efficient transmission. The research project will cover the whole network infrastructure, from the low power end devices and network framework devices, to studying and developing a network server serving the desired application. Innovative network architecture will be proposed, analyzed and evaluated, considering both terrestrial and non terrestrial networks. This includes leveraging on aerial nodes, such as drones, balloons and low earth orbit satellites (LEO). Critical aspects such as scalability, robustness to hardware failures, natural disasters and denial of service attacks will be considered and effectively addressed.</p>
Mandatory traineeship	6
Company cofinancing	Wireless and More Srl

PhD Programme	INGEGNERIA DELL'INFORMAZIONE
Curriculum (if foreseen)	Scienza e Tecnologia dell'Informazione
Type of scholarship	Ex DM 117/2023
Project title	Machine Learning Approaches for the Optimization of Communications and Computing
Supervisor	Michele Zorzi
Supervisor Email	michele.zorzi@unipd.it
Project description	Wireless systems will become more data-centric and data-dependent, and end devices will be using the network not only to communicate but also to perform computation, for example to process data faster. In this sense, an interesting research question is to decide where to perform the processing, i.e., onboard end devices (distributed processing) or at the network (centralized processing) to satisfy communication requirements accordingly. In this context, it was demonstrated that machine learning is a valid tool to optimize wireless networks. This project involves the design, implementation, and evaluation of machine learning solutions to optimize communication and computing resources of wireless networks. The evaluation will be threefold, and include (i) analytical optimization via theoretical methods, (ii) computer full-stack simulations, focusing on the trade-off between centralized and distributed computing, and (iii) field experiments using real network equipment.
Mandatory traineeship	6
Company cofinancing	Wireless and More Srl

PhD Programme	INGEGNERIA DELL'INFORMAZIONE
Curriculum (if foreseen)	Scienza e Tecnologia dell'Informazione
Type of scholarship	Ex DM 117/2023
Project title	Study, design, implementation and optimization of future wireless networks
Supervisor	Michele Zorzi
Supervisor Email	michele.zorzi@unipd.it
Project description	With the advent of new technologies such as 5G, Internet of Things (IoT), and edge computing, cellular networks are undergoing significant transformations. Still, future wireless systems will be ever more data-hungry, and will require the development of new communication protocols able to meet the increasing demands of applications and users, especially in terms of ultra-high data rates and reliability, ultra-low latency, and the support for a massive number of connections. Along these lines, this project involves the design, implementation, and evaluation of new algorithms and methodologies to optimize future wireless networks. The study will explore novel approaches to address critical challenges, for example related to resource allocation, intelligent network management, protocol design, and energy efficiency. The evaluation of the proposed solutions will be threefold, and include, at least, analytical optimization via theoretical methods and computer simulations.
Mandatory traineeship	6
Company cofinancing	CNIT - Consorzio Nazionale Interuniversitario per le Telecomunicazioni

PhD Programme	INGEGNERIA DELL'INFORMAZIONE
Curriculum (if foreseen)	Scienza e Tecnologia dell'Informazione
Type of scholarship	Ex DM 117/2023
Project title	Innovative systems for measuring and monitoring energy consumption
Supervisor	Mirco Rampazzo
Supervisor Email	mirco.rampazzo@unipd.it
Project description	The project aims to study and implement an innovative system for monitoring and analyzing data related to the production, storage, transmission, and consumption of electrical and/or thermal energy. The main goal is to generate useful information for optimal resource management and promote environmental sustainability. Intelligent sensors, communication networks, and data analysis algorithms will be employed to collect real-time data, identify patterns and anomalies, evaluate energy performance, and create predictive models. The ultimate objective is to develop a comprehensive system for monitoring and analyzing energy consumption, enabling informed decision-making to improve energy efficiency and reduce harmful emissions. The project will contribute to research in the field by facilitating a more sustainable resource management and promoting the transition to a low-carbon economy.
Mandatory traineeship	6
Company cofinancing	SMART FUTURE Srl

PhD Programme	INGEGNERIA DELL'INFORMAZIONE
Curriculum (if foreseen)	Scienza e Tecnologia dell'Informazione
Type of scholarship	Ex DM 117/2023
Project title	Artificial intelligence techniques for navigation
Supervisor	Nicola Laurenti
Supervisor Email	nicola.laurenti@unipd.it
Project description	<p>The customary algorithms for positioning and navigation belong to the Least Squares or the Kalman Filter family. However, their effective use relies on a number of assumptions in terms of the measurement statistics, or the available information, that are not always met. Machine learning and other artificial intelligence techniques represent promising solutions to improve the performance of navigation and positioning, especially in harsh propagation conditions or extreme application contexts, as well as in the case of unwanted interference, jamming and/or spoofing attacks. This project aims at proposing innovative solution of this kind to exploit global satellite and mobile network signals providing advances with respect to the current state of the art. The project will include cooperation with international institutions such as the European Space Agency or the EU Agency for the Space Program, where the student is likely to spend his/her visiting period abroad.</p>
Mandatory traineeship	15
Company cofinancing	Qascom S.r.l.

PhD Programme	INGEGNERIA DELL'INFORMAZIONE
Curriculum (if foreseen)	Scienza e Tecnologia dell'Informazione
Type of scholarship	Ex DM 117/2023
Project title	Study of aging models, predictive maintenance, and fault identification using data-driven techniques based on machine learning and artificial intelligence coupled with physics-based models of batteries, power converters, and electric motors
Supervisor	Ruggero Carli
Supervisor Email	ruggero.carli@unipd.it
Project description	<p>The research activity mainly consists in the development of ad-hoc data-driven techniques for the study of battery aging patterns, and for the design of predictive maintenance algorithms and fault identification for power converters and electric motors. In particular, we will focus on the use of the so-called physics-informed approaches which combine classical algorithms of artificial intelligence (such as neural networks) with knowledge deriving from the laws of physics (typically the differential equations that govern a given physical system of interest are added in the calculation of loss functions during the learning phase).</p> <p>These approaches make it possible to significantly reduce the amount of data needed to train the algorithms while improving the generalization properties.</p>
Mandatory traineeship	12
Company cofinancing	Newtven (Hexadrive Engineering Srl)

PhD Programme	INGEGNERIA ECONOMICO GESTIONALE
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Artificial intelligence to improve business processes
Supervisor	Andrea Vinelli
Supervisor Email	andrea.vinelli@unipd.it
Project description	In the current digital era, the impact of artificial intelligence (AI) on business is profound, since it is transforming the ways companies operate and create value for customers and explore new opportunities for growth. Indeed AI, among the others, allows to automate routine tasks, to improve and support decision-making and reduce costs. The project aims at investigating how companies adopt and implement AI to improve business processes, with particular reference to the operations, supply chain management and marketing and customer service.
Mandatory traineeship	8
Company cofinancing	OpenSymbol Srl a socio unico

PhD Programme	INGEGNERIA ECONOMICO GESTIONALE
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Open Water: open information standards for the integrated water service
Supervisor	Carlo Zanchetta
Supervisor Email	carlo.zanchetta@unipd.it
Project description	Definition and implementation of operational and management protocols based on openBIM formats and methodologies for the digital information management of complex systems and territorial hydraulic plant networks in the construction sector. The research involves the study of openBIM standards based on IFC ISO 16739 standards, the identification of standards' IT classes and attributes, useful for digitizing networks and systems in the hydraulic and environmental fields, the extension of those data models with reference to peculiar needs of the funding partner. The project comprehends the transfer of these standards to the internal resources of the institution and the subsequent experimental application of the developed standards. An in-depth analysis of the implementation of the IFC standards in the GIS field is also foreseen in order to understand the interoperability between the territorial scale and the building scale, related to the single intervention or node of the network.
Mandatory traineeship	18
Company cofinancing	ETRA S.p.A.

PhD Programme	INGEGNERIA ECONOMICO GESTIONALE
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Interoperability between BIM and PLM for the coordination of building and plant engineering interventions with high technological and organizational complexity
Supervisor	Carlo Zanchetta
Supervisor Email	carlo.zanchetta@unipd.it
Project description	<p>Definition of digital and information openBIM protocols and interoperable processes between BIM modeling environments and mechanical/electromechanical (PLM) design environments for coordination in the design, construction and assisted management phases of interventions with a high level of technological complexity. The project includes the following activities:</p> <ul style="list-style-type: none"> - the study of interoperable communication techniques between BIM and PLM environments, - the implementation in the coordination platforms of the information models developed in these environments - the management of construction and maintenance processes in data sharing environments or project and facility management platforms. <p>The project will include the implementation of the identified procedures and standards in the context of projects with a high technological and organizational complexity.</p>
Mandatory traineeship	18
Company cofinancing	Kyma S.p.A.

PhD Programme	INGEGNERIA ECONOMICO GESTIONALE
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Guiding firms towards the three megatrends of digitalization, servitization and sustainability
Supervisor	Lara Agostini
Supervisor Email	lara.agostini@unipd.it
Project description	<p>This PhD project is positioned at the crossroad of three megatrends, i.e. sustainability, digitalization, and servitization, that companies are addressing or are likely to deal with in the near future. Indeed, at the international level, the UN has defined 17 Sustainable Development Goals to build a better world for people and our planet by 2030. At the same time, digital technologies are expected to grow at a CAGR of 26.7% until 2030. In turn, firms are realizing that digital technologies, e.g. connected IoT devices, allow offering a plethora of innovative services to their customers. However, these objectives are not independent from one another; therefore, this project aims to support companies in the tough challenge of pursuing servitization and sustainability purposes simultaneously by exploiting digital technologies.</p> <p>To reach this purpose, complementary methodologies are likely to be adopted, as surveys, workshops and case analysis.</p>
Mandatory traineeship	12
Company cofinancing	Considi SpA

Place not available: the financing is not confirmed

PhD Programme	INGEGNERIA MECCATRONICA E DELL'INNOVAZIONE MECCANICA DEL PRODOTTO
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Predictive faults algorithms for electric drive-based circulating pumps
Supervisor	Fabio Tinazzi
Supervisor Email	fabio.tinazzi@unipd.it
Project description	The project aims at developing techniques capable of autonomously and preemptively recognize failures or degradations in the components of an electric motor for applications involving circulators. The developed techniques will make use of as few sensors as possible, thus relying mainly on the information contained in the already available current measurements. The project development will comply with model-based approach, making use of a verified model of the electric drive and development of the techniques using advanced simulation software. This will be followed by experimental validation of the developed techniques on electric drives provided by the company. The innovative techniques developed during the project will benefit from the availability of a large number of real (provided by the company) or simulated (based on the verified model of the drive) test cases, paving the way for the use of machine learning techniques.
Mandatory traineeship	12
Company cofinancing	Taco Italia Srl

PhD Programme	LAND, ENVIRONMENT, RESOURCES, HEALTH
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Decision Support System (DSS) based on sensors for soil compaction reduction
Supervisor	Francesco Marinello
Supervisor Email	francesco.marinello@unipd.it
Project description	The aim of the PhD project is to validate Decision Support System (DSS) for soil compaction reeducation, through theoretical modeling and physical experimentation. The DSS tool will be based on Terranimo model and will operate ideally taking advantage of sensors mounted onboard of agricultural vehicles. The DSS should evaluate and help minimizing the risk of Soil Compaction consequent to tractor tires passage on ground during field operations.
Mandatory traineeship	6
Company cofinancing	Yokohama TWS S.p.A.

PhD Programme	MATERIALS SCIENCE AND TECHNOLOGY
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Study of materials and coating methods for the realization of prototypes for water desalination
Supervisor	Alessandro Martucci
Supervisor Email	alex.martucci@unipd.it
Project description	The project involves the development of coatings of ceramic materials on copper electrodes for the realization of a prototype for seawater desalination. Different types of dielectrics such as BaTiO ₃ obtained by sol-gel technique or other methods from liquid solution will be studied. Various liquid solution deposition methods will also be developed depending on the type of electrode to be implemented in the prototype. In a first step, a demonstrator is to be implemented to verify the effectiveness of salt ion separation in water. In a second phase, a prototype will be designed by going to study the shape, size and positioning of the electrodes coated by the dielectric material.
Mandatory traineeship	6
Company cofinancing	Fresh Water Srl

PhD Programme	MATERIALS SCIENCE AND TECHNOLOGY
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Development of innovative electrocatalysts for hydrogen production
Supervisor	Christian Durante
Supervisor Email	christian.durante@unipd.it
Project description	<p>The project involves the synthesis of innovative materials for dimensionally stable high surface area electrodes based on noble metal oxides as catalysts for the anode compartment of proton exchange electrolyzers (EC). In addition, PGM-free catalysts based on transition metal oxides and dichalcogenides will be evaluated for the cathode compartment of anion-exchange membrane EC with ex situ evaluation of performance in single, dual-chamber, flow and gap-less cells.</p> <p>An integral part of the project will be the selection of the best conditions for catalyst suspension in hydroalcoholic solvent and deposition on polymer membrane through automated spray coating and film casting techniques with precise control of point loading, thickness, layer mesoporosity and film conductivity. The MEAs thus produced will be tested in small-scale cells for activity and stability testing and evaluation of degradation mechanisms.</p>
Mandatory traineeship	6
Company cofinancing	Pietro Fiorentini S.p.A.

PhD Programme	MATERIALS SCIENCE AND TECHNOLOGY
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Protein Based Materials for encapsulation and release of fertilizers
Supervisor	Edmondo M. Benetti
Supervisor Email	edmondo.benetti@unipd.it
Project description	This project will focus on the molecular design of materials for the controlled release of fertilizers.
Mandatory traineeship	6
Company cofinancing	CASALE SA

PhD Programme	MATERIALS SCIENCE AND TECHNOLOGY
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Generation of Urea from ammonia assisted polymers degradation
Supervisor	Edmondo M. Benetti
Supervisor Email	edmondo.benetti@unipd.it
Project description	This project will focus on the development of polymer degradation processes mediated by ammonia to yield fertilizers.
Mandatory traineeship	6
Company cofinancing	CASALE SA

PhD Programme	MATERIALS SCIENCE AND TECHNOLOGY
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	New Zip-like membranes for redox flow batteries in aqueous or organic environment
Supervisor	Vito Di Noto
Supervisor Email	vito.dinoto@unipd.it
Project description	The project is focused on the development of new solid electrolytes/membranes for aqueous and organic flow batteries. The activities of the PhD student will cover the whole value chain starting from the synthesis of the functional materials. The PhD student will then carry out an extensive physicochemical and electrochemical characterization of such materials, allowing to screen the most promising candidates for the fabrication, scalability and testing of lab-scale prototype devices (redox flow battery systems) for performance and cyclability.
Mandatory traineeship	6
Company cofinancing	Eni SpA

PhD Programme	MATERIALS SCIENCE AND TECHNOLOGY
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Studies and test in sodium salts secondary batteries of solid-state electrolyte materials
Supervisor	Vito Di Noto
Supervisor Email	vito.dinoto@unipd.it
Project description	The topic of this PhD position is devoted to the development and study of solid-state electrolyte materials for molten salts sodium secondary batteries. The activities will cover the whole value chain, starting from the synthesis of the materials and proceeding with the physicochemical and electrochemical characterizations. Techniques such as ICP, HR-TGA, MDSC, DMA, ATR-FT-IR, microRaman, HR-SEM, NAP-XPS, CV, EIS will be used in order to study the relationships existing between the composition, thermal properties, structure, morphology and electrochemistry of the materials. Then, the electrical response of the developed electrolytes will be investigated by means of the broadband electrical spectroscopy, in order to unveil the conductivity mechanisms occurring in these materials. Finally, the most performing materials, selected on the basis of stability, ionic conductivity and transference number, will be implemented into lab-scale devices and tested under operating conditions.
Mandatory traineeship	6
Company cofinancing	SoNick SpA

PhD Programme	MATERIALS SCIENCE AND TECHNOLOGY
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Studies and test in sodium salts secondary batteries of cathodic electroactive materials
Supervisor	Vito Di Noto
Supervisor Email	vito.dinoto@unipd.it
Project description	In this PhD project, the student will focus the attention on the development and study of electrode materials for application in molten salts sodium secondary batteries. Different approaches will be used for the synthesis of these materials, such as high-temperature solid-state reaction, hydrothermal reactions, or pyrolysis under vacuum or inert atmosphere. The obtained materials will be extensively characterized in order to study the physicochemical and electrochemical properties. Based on these results, the electrode materials will be further optimized and the best performing materials, in terms of working potential and specific capacity, will be implemented into lab-scale devices and tested under operating conditions.
Mandatory traineeship	6
Company cofinancing	SoNick SpA

PhD Programme	MEDICINA SPECIALISTICA TRASLAZIONALE "G.B. MORGAGNI"
Curriculum (if foreseen)	Biostatistica ed Epidemiologia Clinica
Type of scholarship	Ex DM 117/2023
Project title	Improved Statistical Health Data Analysis: an approach based on Innovative Biostatistics, Open Data and Artificial Intelligence
Supervisor	Dario Gregori
Supervisor Email	dario.gregori@unipd.it
Project description	This project aims to address the challenges of data management in clinical trials by leveraging data mining techniques, machine learning, and artificial intelligence. The research focuses on developing advanced strategies that improve the efficiency, accuracy, and reliability of clinical trial data management processes. By harnessing the power of data mining, the study aims to extract valuable insights from complex and heterogeneous clinical trial datasets, enabling researchers to make data-driven decisions for improved patient outcomes.
Mandatory traineeship	18
Company cofinancing	ZETA Research S.r.l.

PhD Programme	MEDICINA SPECIALISTICA TRASLAZIONALE "G.B. MORGAGNI"
Curriculum (if foreseen)	Biostatistica ed Epidemiologia Clinica
Type of scholarship	Ex DM 117/2023
Project title	Improvement of Clinical Studies through Advanced Biostatistics Approaches
Supervisor	Dario Gregori
Supervisor Email	dario.gregori@unipd.it
Project description	<p>This project aims to explore the use of data mining techniques in clinical trial data management and compare these against traditional biostatistical methods. Initial stages involve a review of literature, with a focus on the strengths and weaknesses of both toolsets. The main research involves implementing various data mining methodologies, such as decision trees and neural networks, within clinical trial contexts and comparing their efficiency, accuracy, and predictability against classical methods.</p> <p>Findings will provide insights into the comparative efficacy of these strategies, and giving recommendations for future application of advanced data mining techniques in clinical trials. As overall outcome, this research aims to offer insights into the applicability of data mining in clinical trials, potentially enhancing data management strategies, and ultimately, improving the quality of patient care and outcomes.</p>
Mandatory traineeship	18
Company cofinancing	ZETA Research S.r.l.

PhD Programme	MEDICINA SPECIALISTICA TRASLAZIONALE "G.B. MORGAGNI"
Curriculum (if foreseen)	Scienze Cardiovascolari
Type of scholarship	Ex DM 117/2023
Project title	Development of advanced data management strategies in clinical trials through the application of data mining techniques
Supervisor	Giuseppe Tarantini
Supervisor Email	giuseppe.tarantini.1@unipd.it
Project description	The project aims to address the pressing need for efficient and sustainable data management strategies in clinical trials. As the volume of data generated in healthcare research continues to grow exponentially, traditional methods of data management have become insufficient. This study proposes the integration of data mining techniques to develop advanced strategies that optimize data collection, storage, analysis, and dissemination, while considering environmental sustainability. By leveraging data mining techniques, valuable insights can be extracted from large datasets, enabling enhanced decision-making processes, accelerating research timelines, and minimizing resource consumption. This research project emphasizes the importance of adopting green and sustainable practices within the context of clinical trials to ensure responsible data management.
Mandatory traineeship	12
Company cofinancing	ZETA Research S.r.l.

PhD Programme	PHYSICS
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Connecting low-and high-energy observables at future colliders
Supervisor	Paride Paradisi
Supervisor Email	paride.paradisi@unipd.it
Project description	<p>Establishing the physics potential of future colliders is one of the main objectives of the HEP community in the coming years. Among the top priorities is a new lepton collider.</p> <p>The aim of the community is on the one hand to consolidate the physics expectations from a circular collider working between the Z-pole and the $t\bar{t}$ threshold (FCC-ee at CERN) and exploring completely new avenues and technologies such as such a multi-TeV e^+e^- or even $\mu^+\mu^-$ collider. This project aims at connecting the potentialities of low-energy experiments (such as the muon $g-2$ experiment at Fermilab, Belle II at KEK, MEG-II at PSI) with the possibilities that will open at precision e^+e^- colliders.</p>
Mandatory traineeship	6
Company cofinancing	INFN - Sezione di Padova

PhD Programme	PHYSICS
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Effective Field Theory for Multi-Boson production at the LHC
Supervisor	Ramona Gröber
Supervisor Email	ramona.groeber@unipd.it
Project description	<p>A global study of the scalar sector of the SM as a whole would shed unprecedented light on the nature of EWSB. Such a study would need to target at once the Higgs boson and the Nambu-Goldstone states that, by virtue of the Equivalence Theorem, can be accessed at high energies in the form of longitudinally polarised W and Z bosons. The goal of this PhD project is a study of multi-boson production in effective field theory (EFT). The goal of this thesis project is to provide theory predictions for EFT analyses in multi-boson production including rare processes such as VVH, HHH and VHH. The role of machine learning algorithms in classification of the various EFT scenarios as well as in signal-background determination will be explored. The project will highly benefit from a close collaboration with the experimental communities of ATLAS/CMS.</p>
Mandatory traineeship	6
Company cofinancing	INFN - Sezione di Padova

PhD Programme	SCIENCES, TECHNOLOGIES AND MEASUREMENTS FOR SPACE
Curriculum (if foreseen)	Mechanical Measurements for Engineering and Space
Type of scholarship	Ex DM 117/2023
Project title	Development of measurement techniques for pollution reduction of brick production
Supervisor	Gianluca Rossi
Supervisor Email	gianluca.rossi@unipg.it
Project description	The research activity will be focused on development of measurement techniques of flow, temperature and working parameters of big industrial plant for brick production. Also the development of useful theoretical models for fluidodynamic analysis and performance optimization will be addressed in order to reduce pollution of this kind of plants.
Mandatory traineeship	6
Company cofinancing	Capaccioli Srl

PhD Programme	SCIENCES, TECHNOLOGIES AND MEASUREMENTS FOR SPACE
Curriculum (if foreseen)	Sciences and Technologies for Aeronautics and Satellite Applications
Type of scholarship	Ex DM 117/2023
Project title	Development of local Thermal Control Units for satellite subsystems and extraterrestrial habitats
Supervisor	Carlo Bettanini
Supervisor Email	carlo.bettanini@unipd.it
Project description	<p>Single on board Thermal Control Units have usually to manage hundreds of heaters and sensors and command several pumps or actuators. This requires high harness volume and mounting effort during integration and the need to of high computational effort for data volume elaboration in operation.</p> <p>Since such resources are limited, integrators need to limit them, often having to face low accuracy of temperature readings or reduced thermal control performances.</p> <p>The local TCU concept is an autonomous control system able to manage groups of heaters, sensors and other heat transport subsystems such as Loop Heat Pipes; it allows agile in-flight power and temperature control and reconfigurability via telecommand reducing system complexity and harnessing.</p> <p>The activity will cover: definition of representative use cases, improved mass, power and TM/TC budget, breadboarding of TCU electronics and algorithms, study of space qualification and certification aspects.</p>
Mandatory traineeship	18
Company cofinancing	I.R.C.A. S.p.A.

PhD Programme	SCIENCES, TECHNOLOGIES AND MEASUREMENTS FOR SPACE
Curriculum (if foreseen)	Sciences and Technologies for Aeronautics and Satellite Applications
Type of scholarship	Ex DM 117/2023
Project title	Integrated navigation and docking systems for small satellites
Supervisor	Francesco Branz
Supervisor Email	francesco.branz@unipd.it
Project description	The project focuses on the development of enabling technologies for the execution of close proximity operations between miniature space vehicles. The broader framework of the project are In-Orbit Servicing and Active Debris Removal missions. The mentioned enabling technologies comprise smart capture/docking mechanisms, multi-sensor packages to measure relative position and attitude parameters, relative pose estimation algorithms through sensor fusion and dynamic models of the system. The design and development activities of such technologies aim at the manufacturing of laboratory prototypes and advanced engineering models. To this aim, theoretical and numerical studies will be supported by hardware implementations to be validated through experimental campaigns at component, subsystem and system level. The activities also include the development of the experimental setups required for the functional and performance evaluation of the prototypes.
Mandatory traineeship	18
Company cofinancing	Stellar Project Srl

PhD Programme	SCIENZE BIOMEDICHE
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	The role of steroid hormones in neurodevelopmental diseases, such as Smith-Magenis syndrome, and neurodegenerative diseases, such as polyglutamine expansion diseases
Supervisor	Maria Pennuto
Supervisor Email	maria.pennuto@unipd.it
Project description	The student will investigate the role of steroid hormones and their receptors in the developmental to adult central nervous system in physiological and pathological conditions, such as SMith Magenis syndrome and polyglutamine expansion diseases, which have a genetic basis and are characterized by symptoms that are in part common. The student will use molecular and cellular biology techniques and in vivo models. The host institution will allow the student to perform microscopy techniques in state-of-the-art models.
Mandatory traineeship	18
Company cofinancing	FONDAZIONE RICERCA BIOMEDICA AVANZATA ONLUS - VIMM

PhD Programme	SCIENZE CLINICHE E SPERIMENTALI
Curriculum (if foreseen)	Scienze epatologiche e trapiantologiche, malattie rare e ad alta complessità biotecnologica
Type of scholarship	Ex DM 117/2023
Project title	Effectiveness and efficiency of clinical-assistance roles/skills and innovative and/or new models in the Italian and local context, within four research areas: organizational-assistance, clinical nursing, multi-professional/multi-disciplinary, new technologies
Supervisor	Paolo Angeli
Supervisor Email	pangeli@unipd.it
Project description	<p>Effectiveness and efficiency of clinical-assistance roles/skills and innovative and/or new models in the Italian and local context, within four research areas:</p> <ul style="list-style-type: none"> -organizational-assistance: innovative models for prescribing and administering therapy, implementation of Case Management, Bedside and Handover document system, implementation of the ERAS protocol (Enhanced Recovery After Surgery), -clinical nursing: pain management for patient categories, delirium prevention, physical restraint management, prevention and treatment of skin lesions, -multi-professional/multi-disciplinary: implementation of advanced nursing skills, also through task-shifting processes (artificial ventilation, vital parameters monitoring, echo-fast, haemofiltration, vascular accesses, ...), -new technologies: teleassistance, products for advanced medications, smart beds, tools to reduce the risk of Manual Handling of Loads (MMC).
Mandatory traineeship	18
Company cofinancing	Azienda Ospedale - Università Padova

PhD Programme	SCIENZE CLINICHE E SPERIMENTALI
Curriculum (if foreseen)	Scienze nefrologiche, dell'esercizio fisico e della nutrizione
Type of scholarship	Ex DM 117/2023
Project title	Development and validation of novel clinical-instrumental investigations in mountain medicine
Supervisor	Andrea Ermolao
Supervisor Email	andrea.ermolao@unipd.it
Project description	<p>Cardiometabolic diseases are on the rise and are associated with an increased risk of mortality. One strategy to reduce this risk is to promote physical exercise, which can also include mountain activities, which are increasingly accessible and popular; however, exposure to altitude may have limitations and potential contraindication in patients with cardiometabolic diseases due to the reduced partial pressure of oxygen in inspired air.</p> <p>Over the years, the medical problems associated with exposure to altitude have been studied and tests and scores have been developed to evaluate people's susceptibility to the development of altitude sickness, such as tests in hypoxia or the SHAI score. The aim of the project is to study and develop innovative methods not only to evaluate the susceptibility to the development of high altitude diseases, but also the exposure to altitude of subjects with chronic cardiometabolic diseases.</p>
Mandatory traineeship	18
Company cofinancing	Eurac Research

PhD Programme	SCIENZE CLINICHE E SPERIMENTALI
Curriculum (if foreseen)	Scienze nefrologiche, dell'esercizio fisico e della nutrizione
Type of scholarship	Ex DM 117/2023
Project title	Exoskeleton at workplace: myth or fact? the EXO-LIFT study
Supervisor	Marco Bergamin
Supervisor Email	marco.bergamin@unipd.it
Project description	<p>The main cause of occupational diseases in Italy in the last years has been work-related musculoskeletal disorders (WRMSD). Exoskeletons for human bodies follow the overarching idea of stabilizing their wearers and reducing musculoskeletal injuries.</p> <p>The project will start with an observational phase in which the selected workstations will be evaluated with a focus on ergonomics, WRMSDs, pain, physical efficiency.</p> <p>A second phase of the project will be defined as interventional phase in which the workers involved will wear the exoskeleton. The same operators will be evaluated at the beginning and at the end of the period of exoskeleton use, with the same measurements as in the observational phase. The main objective is to evaluate the long-term response to the use of the exoskeleton in a work environment for the parameters mentioned above and the impact of the exoskeleton in the equations for predicting the risk of biomechanical overload.</p>
Mandatory traineeship	18
Company cofinancing	Gymhub S.r.l. - Spin-off dell'Università di Padova

PhD Programme	SCIENZE CLINICHE E SPERIMENTALI
Curriculum (if foreseen)	Scienze nefrologiche, dell'esercizio fisico e della nutrizione
Type of scholarship	Ex DM 117/2023
Project title	Digitization in ergonomic and human movement assessment to reduce work-related musculoskeletal disorders
Supervisor	Marco Bergamin
Supervisor Email	marco.bergamin@unipd.it
Project description	<p>Work-related musculoskeletal disorders (WRMSDs) can be defined as abnormalities in the soft tissues of the upper limbs and lower limbs, bones, and joints. Several patho-mechanisms, contribute to the risk of WRMSDs development, particularly when associated with physical risk factors such as strength and posture.</p> <p>The research will start with an observational phase aiming to identify factors to be included in a new predictive model of ergonomic risk assessment. Therefore, this phase will concern the assessment (ergonomic, musculoskeletal and physical efficiency) of a selected work-environment. After that, a second phase will involve data integration into a single equation model for a more refined musculoskeletal risk indicator. This equation will identify a potential relationship between measures of “man-machine” equipment and parameters of workers’ physical efficiency. This process will be then digitized in order to simplify data output and analysis.</p>
Mandatory traineeship	18
Company cofinancing	Gymhub S.r.l. - Spin-off dell'Università di Padova

PhD Programme	SCIENZE DELL'INGEGNERIA CIVILE, AMBIENTALE E DELL'ARCHITETTURA
Curriculum (if foreseen)	Rischio, vulnerabilità, ambiente, salute e territorio
Type of scholarship	Ex DM 117/2023
Project title	FSE code checking: openBIM algorithms and guidelines for checking project compliance with fire regulations
Supervisor	Carlo Zanchetta
Supervisor Email	carlo.zanchetta@unipd.it
Project description	<p>Definition of digital and information openBIM protocols in relation to the discipline of safety engineering with particular reference to fire prevention and code checking processes connected to current legislation.</p> <p>The project involves the study of the IFC ISO 16739 standard and the analysis of the fire prevention code in relation to its possible translation into openBIM information classes and attributes.</p> <p>The purpose of the study is the creation of algorithms based on the IFC data model for the verification of compliance of building projects in accordance with the fire prevention code and the drafting of guidelines for the compilation of projects in order to be able to use these algorithms.</p>
Mandatory traineeship	18
Company cofinancing	ESSE TI ESSE INGEGNERIA Srl

PhD Programme	SCIENZE FARMACOLOGICHE
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Evaluation of the effects and mechanisms of N-acylethanolamines in primary glial cultures exposed to inflammatory stimuli
Supervisor	Morena Zusso
Supervisor Email	morena.zusso@unipd.it
Project description	<p>N-acylethanolamines (NAEs) are lipid signaling molecules that have similar chemical structures to endocannabinoids but that do not have affinity for cannabinoid receptors. Among NAEs, N-palmitoylethanolamine (PEA) is an autacoid local injury antagonist amide (ALIAMide) abundant in the CNS and conspicuously produced by neurons and glial cells. PEA has extensively documented anti-inflammatory, analgesic, immunomodulatory, and neuroprotective effects acting at several molecular targets in both central and peripheral nervous systems. Furthermore, recent studies have revealed that some derivatives of PEA exert stronger anti-nociceptive and anti-inflammatory effects than PEA.</p> <p>Based on this evidence, the general aim of this project is to investigate the effects and the molecular mechanisms underlying the anti-inflammatory activity of NAEs in primary glial cultures exposed to different inflammatory stimuli (e.g., lipopolysaccharide, amyloid β, inflammatory cytokines, opioid drugs, etc).</p>
Mandatory traineeship	6
Company cofinancing	Epitech Group SpA unipersonale

PhD Programme	SCIENZE MATEMATICHE
Curriculum (if foreseen)	Matematica Computazionale
Type of scholarship	Ex DM 117/2023
Project title	Batch and near-real-time Optimization for sustainable supply and production chains
Supervisor	Francesco Rinaldi
Supervisor Email	francesco.rinaldi@unipd.it
Project description	<p>The widespread application of AI techniques and emerging sustainability challenges have led decision support systems to tackle increasingly complex optimization problems.</p> <p>Moreover, in several contexts, re-planning becomes necessary due to events which invalidate the previous decisions: real-time reactions are needed.</p> <p>The growing size of the problem and the less available processing time contradict one another: the computing power is insufficient to ensure the resolution of complex problems; therefore, an increasingly efficient and diversified framework of exact, heuristic and quantum algorithms is becoming necessary.</p>
Mandatory traineeship	6
Company cofinancing	Spindox S.p.A.

PhD Programme	SCIENZE MOLECOLARI
Curriculum (if foreseen)	Scienze Chimiche
Type of scholarship	Ex DM 117/2023
Project title	Study on the interaction between chemical structure of different superplasticizers and performances of fresh and hardened concrete with focus on low CO2 emission-concrete
Supervisor	Edmondo M. Benetti
Supervisor Email	edmondo.benetti@unipd.it
Project description	This project will focus on the synthesis and characterization of polymeric additives for ecosustainable concrete materials.
Mandatory traineeship	6
Company cofinancing	Master Builders Solutions Italia SpA

PhD Programme	SCIENZE MOLECOLARI
Curriculum (if foreseen)	Scienze Chimiche
Type of scholarship	Ex DM 117/2023
Project title	Investigations on the synthesis and characterization of carbon nanostructure derivatives for the photocatalytic conversion of waste products
Supervisor	Enzo Menna
Supervisor Email	enzo.menna@unipd.it
Project description	Carbon nanostructures such as graphene and carbon nanotubes will be chemically modified to obtain hybrid materials using light as a source of energy to enable photocatalytic and photo-electrocatalytic processes to degrade waste products while producing synthetic fuels. To this purpose, carbon nanostructures will be functionalized with photoactive moieties promoting light absorption and formation of charge separation states and with structures showing catalytic properties. The role of the sp ² carbon lattice as charge transport layer and as adsorbing surface for pollutants will be explored. Functionalization will be also aimed to provide solubility to the material to improve processability and to maximize the availability of active sites, in particular in water. The possibility to reuse active materials will be a focus of the project, in the frame of circular economy approach.
Mandatory traineeship	6
Company cofinancing	Way Point Srl

PhD Programme	SCIENZE MOLECOLARI
Curriculum (if foreseen)	Scienze Chimiche
Type of scholarship	Ex DM 117/2023
Project title	Multifunctional Molecules for Applications in Ophthalmic Surgery
Supervisor	Fernando Formaggio
Supervisor Email	fernando.formaggio@unipd.it
Project description	<p>The project aims at screening, evaluating and optimizing substances used as intraocular tamponades in retinal surgery and media formulations employed in the field of corneal transplantation. To this aim a systematic approach will be adopted, screening and testing molecules possessing specific functionalities, while considering their chemical properties and interactions with ocular tissues. Comprehensive chemical characterization of substances and modified media will be conducted using techniques such as NMR, HPLC, GC, GPC, XRD, LD-PSD, CD, ITC, MALDI-TOF and others. Testing models will be developed as needed.</p> <p>Collaborations with experts in industrial development of medical devices and university researchers will provide access to cutting-edge facilities, technologies, and a wide range of expertise, allowing to combine industrial expertise with an academic approach to achieve significant results in the field of ophthalmic surgery.</p>
Mandatory traineeship	18
Company cofinancing	AL.CHI.MI.A. S.r.l.

PhD Programme	SCIENZE MOLECOLARI
Curriculum (if foreseen)	Scienze Farmaceutiche
Type of scholarship	Ex DM 117/2023
Project title	Pharmaceutical formulation-container interaction studies, physicochemical stability evaluations and definition of standard operation procedures
Supervisor	Paolo Caliceti
Supervisor Email	paolo.caliceti@unipd.it
Project description	The PhD project deals with physicochemical investigation of interaction of colloidal drug delivery systems with surfaces of primary packaging and aims at establishing validated analytical guidelines supporting the development of primary packaging that guarantee formulation stability and finally support regulatory agencies in evaluation of pharmaceutical products. Innovative colloidal formulations, including solid lipid nanoparticles used in COVID-19 vaccination, can impact with surfaces of primary packaging containers during filling, storage and transportation, resulting in formulation instability and in turn affecting their therapeutic performance. Representative formulation prototypes of advanced products will be prepared and handled according to standard pharmaceutical industry processing. Physicochemical investigations will be carried out by advanced techniques, including light scattering (DLS, NTA etc.), microscopy (SEM, TEM, AFM), spectrometry (CD, fluorescence, MS etc.).
Mandatory traineeship	12
Company cofinancing	NUOVA OMPI S.r.l. UNIPERSONALE

PhD Programme	SCIENZE STATISTICHE
Curriculum (if foreseen)	
Type of scholarship	Ex DM 117/2023
Project title	Statistical Models for Optimization and Sustainability of the Tanning Process
Supervisor	Luigi Grossi
Supervisor Email	luigi.grossi@unipd.it
Project description	<p>In recent years, there has been a growing interest in applying statistical analysis techniques to optimize and improve the efficiency and sustainability of the tanning process. Several studies have focused on utilizing statistical models to enhance the quality of the final leather product while minimizing waste and resource consumption. One area of research has been the identification and analysis of variables that affect the quality of leather. Furthermore, statistical tools have been developed to detect and address anomalies or outliers in the tanning process data. By addressing these anomalies, researchers aim to improve the accuracy of data analysis and model predictions. Another important aspect of statistical analysis in the tanning process is sustainability assessment. With the help of the project partner, the data currently collected from electronic devices positioned along the tanning process will be analyzed to identify their potential and limitations.</p>
Mandatory traineeship	12
Company cofinancing	GER Elettronica Srl

PhD Programme	SOCIAL SCIENCES
Curriculum (if foreseen)	Sociology
Type of scholarship	Ex DM 117/2023
Project title	Nuclear fusion energy in the public sphere and its social implications
Supervisor	Federico Neresini
Supervisor Email	federico.neresini@unipd.it
Project description	The scientific and economic implications of fusion energy are well known, since it could provide a source of sustainable, safe, and almost limitless energy to exploit for the electricity production as well as for other applications in industry. However, the social implications of fusion are far less investigated in current research: fusion displays the potential to change the way we produce, distribute, consume energy on a global scale, contributing in the long-term decarbonization of power generation while at the same time ensuring availability and affordability of supply. The PhD candidate is expected to realize a research project with a focus on how energy innovations related to fusion enter the social sphere eliciting reactions, expectations or even controversies in the political and public debate, and how such societal implications can concretely contribute to shape the development trajectories of fusion technologies.
Mandatory traineeship	6
Company cofinancing	Eni SpA