Up to 10 SCHOLARSHIPS FUNDED THROUGH THE EUREKA PROGRAM, for unemployed individuals residing in the Marches Region

Research topic description
Manufacturing, Wood mobile, Industry 4.0, Turism, Environmental Energy Innovation Building, Mechanical and Mechatronics Engineering, Innovative Materials, Agribusiness, Blue Economy, Personal Service

Up to 4 SCHOLARSHIPS FUNDED THROUGH THE "Dottorato Innovativo" PROGRAM, for unemployed individuals residing in the Marches Region

Research topic description
Gli ambiti di intervento per sviluppare i progetti di ricerca sono nell'ambito delle 12 aree di specializzazione individuate dal PNR 2015-2020, alle quali si aggiunge un'ulteriore tematica sul "Disaster Risk Reduction" promossa dalle Nazioni Unite (Sendai Framework 2015-2030) e divenuta centrale nell'Agenda della Regione Marche. Particolare attenzione e' riservata alle aree del manifatturiero sostenibile; l'agro alimentare, con una proiezione anche verso la valorizzazione del territorio e del paesaggio a fini turistico- produttivi; la meccanica/meccatronica; la riduzione del rischio di catastrofi naturali. Potranno anche essere proposte "application" in materia di sicurezza digitale e di economia circolare.

Up to TWO POSITIONS reserved for the people working with or within FHNW for carrying on researches on BUSINESS INFORMATION SYSTEMS in the context of the AGREEMENT between UNIVERSITY OF CAMERINO and UNIVERSITY OF APPLIED SCIENCES AND ARTS, Nortwestern Switzerland, FHNW School of Business .

	Research topics description		
1	**Digitalization in distribution grids operation.** Energy grid operators are exposed simultaneously to a decentralization of supply, an increased pressure on decarbonization targets and on costs, while having to maintain a significant level of security of supply. Considering possible synergies in multi-carriers and multiservice city distribution companies, further digitalization contributes to these targets by enhancing the modelling accuracy of the interdependency between security of supply and sizing of storage infrastructure, and thus reaching a better use of their demand response potential	Science and Technology - Computer Science	Holger Wache
2	**Supporting Lecturers in Practical Teaching of Business Information Systems.** As has been pointed out by several researchers, the highest levels in the learning process, i.e. virtuosity and true expertise, can only be reached via a person's own experiences as practitioner of the relevant skills. Therefore, teachers in professional programs shall help students achieve real practical experience (see Flyvbjerg 2006). Providing feedback to students' results when solving practical cases is a challenge. This research shall explore and develop a method to assess students' performance in enterprise modeling by checking models of practical situation with respect to correct usage of modeling languages and appropriateness of models. This research builds on previous research results on ontologybased metamodeling and applies automated reason and machine learning methods from Artificial Intelligence.	Science and Technology - Computer Science	Knut Hilkemann

Up to TWO SCHOLARSHIPS FUNDED THROUGH THE AGREEMENT BETWEEN UNICAM AND THE INGV (NATIONAL INSTITUTE OF GEOPHYSICS AND VOLCANOLOGY)

	Research topic description	Research and PhD Cu	Supervisor
1	**Novel approaches in Earthquakes Science; from the field observations to the modelling of the results**. Crustal faults are complex natural systems whose mechanical properties evolve over time thus the understanding of the multi-scale, physical/chemical processes responsible for earthquakes and faulting requires considering phenomena that intersect different research fields, modelled with innovative techniques. We support projects grounded on small- to large-scale seismically active fault systems, focussed on the understanding of the role of the most different parameters, in the earthquakes preparatory phase and deformation processes.	Science and Technology - Physical and chemical processes in Earth systems	Emanuele Tondi
2	**New approach for seismic hazard analysis and earthquake damage scenarios.** The definition of a new generation of time-dependent and deterministic seismic hazard evaluation procedures has the ambitious outcome of developing tools for predicting the time-space seismic sequences evolution, and the related ground-motion level, useful for the implementation of advanced integrated strategy for seismic risk reduction and disaster planning. We support project that integrate the simulation of complex earthquake source and wave radiation processes with the aim to get reliable predictions of the variability of the strong ground motion around the causative fault system and a more accurate estimate of the expected distributions of engineering parameters in relation to the possible spectrum of earthquakes that may cause damages in the areas of interest.	Science and Technology - Physical and chemical processes in Earth systems	Emanuele Tondi

Up to FIVE SCHOLARSHIPS FUNDED THROUGH THE AGREEMENT BETWEEN UNICAM AND LIAOCHENG UNIVERSITY (CHINA), reserved to Chinese candidates graduated in Liaocheng University

Research fields
Physics, Mathematics, Chemistry, Biology

Up to FIVE SCHOLARSHIPS FUNDED THROUGH THE AGREEMENT BETWEEN UNICAM AND ZHENGZHOU UNIVERSITY (CHINA), reserved to Chinese candidates graduated in Zhengzhou University

Research fields
Food Sciences, Chemistry, Biology

RESEARCH TOPICS LIST

	Research topic description	Area of Research and PhD Curriculum	Supervisor
1	**Kinematics of the Central Mediterranean.** The project aims to utilize a new approach to the structural and tectonic analysis of the Central Mediterranean system, based on a non-rigid plate kinematics approach. This approach allows to determine finite rotations for the tectonic blocks involved in the evolution of the Apennine and Alp chain, though in a framework that allows finite strain of the tectonic elements during their rotation. The most evident limitation of classic plate kinematics is represented by the assumed rigidity of the tectonic elements during their motion, with well-defined boundaries. Conversely, the formation of mountain chains is a process that can be described in terms of ductile behaviour of the rock systems, without any possibility to identify rigid blocks. A possible overcome of the limitations of classic kinematics requires the release of the rigidity hypothesis, thereby the crustal blocks can deform during their rotations**.** **In this instance, the tectonic structures within a deformable region will be used to determine both the finite strain of the block and its motion with respect to a reference frame.** **KINEMATICS OF THE CENTRAL MEDITERRANEAN**	Science and Technology - Physical and chemical processes in Earth systems	Pietro Paolo Pierantoni
2	**Machine learning techniques for condensed matter physics and complex systems.** The project will focus on the application of machine-learning (ML) techniques to problems in many-body physics, ultra-cold gases and superconductivity, with possible applications also to the private sector (e.g., for booking engines). We plan to employ various ML techniques, including, e.g., multi-layer perceptrons and stochastic Boltzmann machines, to make accurate and computationally affordable predictions for the properties of complex quantum systems (e.g, disordered atomic gases).	Science and Technology - Theoretical and experimental physics	Pierbiagio Pieri; Sebastiano Pilati

3	**Development of methods for food quality assessment.** The project aims to provide new methods for the assessment of food quality by means of identification and quantification of new chemical markers, after development of appropriate analytical methods for their analysis. Gas chromatography coupled to mass spectrometry (GC-MS) and to flame ionization detection (GC-FID), high performance liquid chromatography coupled to mass spectrometer detectors (HPLC-MS), fluorimetric detector (HPLC-FLD) or diode array detector (HPLC-DAD) will be exploited to this purpose. Several techniques will be applied for the sample preparation, like solid-phase microextraction (SPME), solid-phase extraction (SPE) or liquid-liquid extraction.	Chemical and Pharmaceutical Sciences and Biotechnology - Chemical Sciences	Dennis Fiorini
4	**Title: New synthetic methodologies for the preparation and derivatization of heterocyclic systems.** The growing number of biologically active compounds featured by the indole nucleus and other nitrogen containing heterocycles makes the study of their preparation and synthetic transformations particularly interesting and indispensable. The proposed research plan is aimed to provide new synthetic pathways for the preparation and functionalization of heterocyclic systems. Particularly, the reactivity of sulfonyl indoles and other azole derivatives amenable of generating indolenine intermediates, will be studied. These unprecedented procedures would complement the classical Friedel-Crafts reaction in introducing a wide array of functional groups into the heterocyclic ring. The PhD candidate will reach these goals exploiting new generation techniques such as flow chemistry, microwave activated processes and the use of solid supported systems	Chemical and Pharmaceutical Sciences and Biotechnology - Chemical Sciences	Marino Petrini - Alessandro Palmieri

5	**Title: Design and development of smart composite materials for eco-friendly antimicrobial applications** Topics: Microbial infection currently represents one of the most serious problems of the society. This is particularly urgent in a number of fields such as water purification systems, food packaging and storage, textiles, medical devices, and health care applications. Infection diseases are caused by germs (bacteria, viruses, fungi and protozoa), which are found everywhere, in air, soil and water. Mainly, such infections are passed by touching, eating, drinking or breathing something that contains germs. In recent years the search for novel efficient antimicrobial materials to be used as components in water treatment systems (valves, taps, connectors, tubes and filter housing, vessels, films and capillary tubular membranes) or for safe water containers (bottles, tanks) has increasingly receiving interest from both academic research and industry. The present research project aims to the rational design of new polymeric composite materials with antimicrobial activity, for a range of application in the fields of water and fluids treatment and storage, as well as textiles and medical devices. New metal-containing substances, mainly with silver and copper ions, will be designed and synthesized, chemically characterized and their antimicrobial and antiadhesive activity tested, with particular attention to avoid toxicity for humans. The best candidates from these screenings will be embedded in polymeric matrixes (mainly PE, PU, PS and PVC) as well as in porous carbon adsorbents from agricultural residues and the new composites investigated for their potential application as ecofriendly functional materials	Chemical and Pharmaceutical Sciences and Biotechnology - Chemical Sciences	Enrico Marcantoni-Cristina Cimarelli-Serena Gabrielli

6	**Title: Design and development of smart composite materials for eco-friendly antimicrobial applications** Topics: Microbial infection currently represents one of the most serious problems of the society. This is particularly urgent in a number of fields such as water purification systems, food packaging and storage, textiles, medical devices, and health care applications. Infection diseases are caused by germs (bacteria, viruses, fungi and protozoa), which are found everywhere, in air, soil and water. Mainly, such infections are passed by touching, eating, drinking or breathing something that contains germs. In recent years the search for novel efficient antimicrobial materials to be used as components in water treatment systems (valves, taps, connectors, tubes and filter housing, vessels, films and capillary tubular membranes) or for safe water containers (bottles, tanks) has increasingly receiving interest from both academic research and industry. The present research project aims to the rational design of new polymeric composite materials with antimicrobial activity, for a range of application in the fields of water and fluids treatment and storage, as well as textiles and medical devices. New metal-containing substances, mainly with silver and copper ions, will be designed and synthesized, chemically characterized and their antimicrobial and antiadhesive activity tested, with particular attention to avoid toxicity for humans. The best candidates from these screenings will be embedded in polymeric matrixes (mainly PE, PU, PS and PVC) as well as in porous carbon adsorbents from agricultural residues and the new composites investigated for their potential application as ecofriendly functional materials	Chemical and Pharmaceutical Sciences and Biotechnology - Chemical Sciences	Fabio Marchetti - Corrado Di Nicola

7	**Title: Synthesis, Characterization, and Biological Studies of New Ru(II)/Os(II)-Arene Complexes Containing Bioactive Ligands** Topics: Cancer is rapidly becoming the top killer in the world and most of the FDA approved anticancer drugs are organic molecules while metallodrugs are very scarce. The advent of the first metal based therapeutic agent, cisplatin, launched a new era in the application of transition metal complexes for therapeutic design. Due to their unique and versatile biochemical properties, ruthenium-based compounds have emerged as promising anti-cancer agents that serve as alternatives to cisplatin and its derivatives. Ruthenium(II) and Osmium(II) complexes have attracted significant attention as anticancer candidates in the last decade, however only a few of them have been reported comprehensively. The present research project aims to the rational design of new Ru(II)/Os(II)-arene complexes containing bioactive ligands, such as curcumin or curcumin-like ligands, the study of their anticancer activity in both in vitro (cytotoxicity and migration assays) and in vivo (chicken chorioallantoic membrane) models and the identification of their mechanism of action.	Chemical and Pharmaceutical Sciences and Biotechnology - Chemical Sciences	Riccardo Pettinari
8	**Title: Studies of molecular and neurobiological mechanisms in drug addiction and mood disturbances** Topic: The main research focus is on the study of the neurobiological basis of abnormal behavioral and brain functions relevant to human psychopathology with emphasis on drug addiction and mood disorders. The majority of this work is directed at the understanding the neurological mechanisms responsible for these aberrant behaviours and at identifying innovative pharmacological targets to aid the development of new more effective treatments. Attention is also dedicated to the study of neurocircuitry molecular and electrophysiological mechanisms controlling emotional and cognitive disturbances associated with protracted exposure to drugs of abuse or chronic stress.	Chemical and Pharmaceutical Sciences and Biotechnology - Pharmaceutical Sciences	Roberto Ciccocioppo

9	**Title: Chronic pain is a debilitating difficult to treat with currently available medications.** Topics: Often opioid agonists are employed, but their use is associated with serious negative consequences like development of drug addiction. We are seeking applicants interested to investigate the link between chronic neuropathic pain and development of psychiatric conditions including deterioration of cognitive performances, depression and development of substance use disorder. To exploit these investigations in rodents several approaches from various disciplines (i.e., behavioral pharmacology, molecular biology, electrophysiology) will have to be combined. Chemiogenetics and optogenetics will also be used to explore neuronal reorganization in response to chronic pain or exposure to opioid agonists. In addition, the candidate will explore, at preclinical level, new mechanisms for the development of innovative pharmacotherapeutics to chronic neuropathic pain.	Chemical and Pharmaceutical Sciences and Biotechnology - Pharmaceutical Sciences	Roberto Ciccocioppo
10	**Improving Food Quality and Safety.** PhD candidate will have to deal with different approaches for improving food characteristics, which span from analytical studies of constituents, to set-up of algorithms for theory based food preparation, to study of processes related to food preparation and storage. Food under study could be (as examples): coffee, legumes, dairy products, fresh and processed meat, and so on.	Chemical and Pharmaceutical Sciences and Biotechnology - Pharmaceutical Sciences	Sauro Vittori
11	**Nutrigenomics of bioactive food compounds.** Low grade inflammation characterizes several diseases. The aim of this project is to screen selected bioactive compounds for their capacity to modulate low inflammation in human adipocytes. Gene expression and epigenetic modulation (DNA methylation and histone modification) will be used to identify how bioactive food components can work in the modulation of inflammatory pathways.	Life and Health Sciences - Molecular Biology and Cellular Biotechnology	Rosita Gabbianelli