MIT Portugal

Training the Leaders of the Future

Doctoral Students 2010

Massachusetts Institute of Technology

FCT Fundação para a Ciência e a Tecnologia

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

MIT Portugal

Training the Leaders of the Future

Doctoral Students 2010

Academic Institutions Providing PhD Degrees in Association

Escola da Engenharia da Universidade do Minho
Faculdade de Ciências da Universidade de Lisboa
Faculdade de Ciências e Tecnologia da Universidade de Coimbra
Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa
Faculdade de Economia da Universidade de Coimbra
Faculdade de Engenharia da Universidade do Porto
Instituto Superior de Economia e Gestão da Universidade Técnica de Lisboa
Instituto Superior Técnico da Universidade Técnica de Lisboa

Other Institutions Involved in R&D Activities

Instituto Politécnico de Portalegre
Instituto Politécnico de Setúbal
Instituto Superior de Agronomia da Universidade Técnica de Lisboa
Instituto Superior de Ciência do Trabalho e da Impresa
Universidade de Aveiro
Universidade da Beira Interior
Universidade de Trás-os-Montes e Alto Douro

CONTENTS

TRAINING THE LEADERS OF THE FUTURE

The MIT Portugal Program, launched in October 2006, has pioneered a model of intense, open and broad international collaborations in Portugal, based on a multi-level partnership between Portuguese Research institutions, Universities, Companies and the Massachusetts Institute of Technology (MIT).

Last year, our revisited approach was focused on "Engineering Systems in Portugal", promoting the value of multidisciplinarity and cooperation to solve complex real life problems, with a basis in four main interrelated vectors: **People, Knowledge, Ideas and Institutions.**

We developed this approach by bringing students from all over the world to study and conduct research in Portuguese Universities. Our collaboration has fostered strong partnerships between Portuguese university groups and industry in our targeted application areas, including Stem Cell Engineering for Regenerative Medicine, Sustainable Energy and Transportation Systems, and Materials and Design-Inspired Products.

This partnership has succeeded in enhancing the international dimension of Portugal's higher education system in these domains. Our seven Doctoral and Executive Master programs host over 300 PhD and about 155 executive master students, from over 40 countries. Our efforts to create this educational platform are dedicated to **achieving a major goal: to create a new generation of leaders with unique knowledge and a global perspective,** who can assume key positions in industry and research in order to make a critical contribution to Portugal's future economic growth and reach into international markets.

The global marketplace in which these new leaders must operate is characterized by increasing differences between countries and regions, with an increasing importance of markets in newly industrializing economies, and new powers of knowledge in specific areas. The increasing speed with which goods circulate and market forces evolve has allowed rapid rises in prosperity, but also exposes the global economy to new forms of shocks and crises. For nations to prosper in such a dynamic environment, they must commit themselves to local values and skills – that is, to People, Knowledge, Ideas and Institutions – while connecting themselves to the network of nations and peoples that are designing the future. This constitutes the major motivation for any international partnership.

We aim at no more and no less than this: to be an open, international platform that constitutes a network of multidisciplinary knowledge focused on people; to create value through the development and demonstration of new ideas in Portugal; and to promote scalable living laboratories to develop and test these emerging technologies and systems, which our partners, including Portuguese industry, may develop, explore and export worldwide.

In this venture, the heroes are the **Students**, their character and their skills. In this book we proudly present their faces, background, ambitions and their current research. They will design the future – that will be their journey and their challenge – and our privilege is to provide them with the framework to succeed in it!

Daniel Roos, Director of MPP at MIT

Paulo Ferrão, Director of MPP in Portugal

DOCTORAL PROGRAMS THROUGH A CONSORTIUM OF PORTUGUESE UNIVERSITIES IN COLLABORATION WITH MIT

The MIT Portugal Program brings together a dynamic and unprecedented consortium of universities across Portugal, along with the best of MIT educational and research expertise, to collaborate in high-quality teaching and research. The partners in this unique collaboration strive to make MIT Portugal a model international program in post-graduate education designed to train a new generation of leaders with unique abilities, and a global perspective in cutting-edge areas of science and technology.

The doctoral programs have been created in close collaboration between faculty in MIT and in the Portuguese participating universities. These programs provide world-class learning opportunities, which address some of the world's most pressing scientific, environmental and socioeconomic challenges.

This new approach to doctoral training goes well beyond all conventional natural science or engineering domains. Innovative educational approaches coupled with cutting-edge research, putting concepts and tools of systems thinking at the centre of student knowledge and experience, will enable the young students and researchers to explore and understand the economic, social and technical issues that are intrinsic to any management roles they will undertake if they go into industry, and will widen the scope of their research and education should they remain in academia.

The Program implements this systems approach through an ongoing partnership among 8 Portuguese universities, and 20 Portuguese research centers and national laboratories, and 25 MIT departments, and all 5 Schools within MIT. Participating students have a unique opportunity to conduct research during visits of up to 18 months to the MIT campus in Massachusetts. Altogether 71 new modules have been developed for teaching in our programs, many of which introduce curricular elements that are novel to Portuguese and to international engineering education. In total, some 210 faculty in Portugal and 62 faculty in MIT are involved in this Program, which has attracted 303 postgraduate students from 39 countries during its 4 years of existence.

The four doctoral programs offered by the MIT Portugal Program are:

Bioengineering Systems
Leaders for Technical Industries
Sustainable Energy Systems
Transportation Systems

The different features of the four PhD programs are described in the following pages.

Natália Dias
Director of Education in Portugal

Josh Jacobs
Director of Education at MIT

BIOENGINEERING SYSTEMS PhD

Traditional programs in bioengineering and related disciplines provide fundamental engineering and life science building-blocks as a foundation for the curriculum and associated research efforts. The Bioengineering Systems doctoral program has changed this paradigm. **The Bioengineering Systems doctoral program combines engineering, biology, biotechnology and neuroscience in the curriculum, coupled with training and experience in innovation, leadership, and systems thinking, in order to produce a new generation of bioengineering innovators.**

The curriculum of the program is a comprehensive program of coursework delivered in two- or three-week modules taught jointly by faculty from Portuguese universities and MIT. The joint teaching by faculty from across Portugal, as well as from MIT, provides students with an international view of science, engineering, and research, building stronger and more effective collaborations.

The coursework includes core modules, which are mandatory, and elective modules which students can select from a range of options. All students get training in leadership, innovation, and entrepreneurship. In addition, there are two nine-week research laboratory rotations along with the Bio-Teams project. In the Bio-Teams project, students are given real technologies developed at laboratories in Portugal and, working in teams, they evaluate them, validate assumptions, and gauge their market potential. Students learn about the realities of the world business and build strong connections as they network with Portuguese companies and stakeholders throughout the world. Many Bioengineering students are hosted by MIT laboratories where they carry out part of their thesis research. **All of this specialized training allows students to develop unique skills which will enable them to become future leaders in biotechnology and engineering.**

The distinctive structure of this doctoral program makes it significantly different from other doctoral programs in Bioengineering or Life Sciences. The strong emphasis in technical innovation and leadership development; the contact with the most significant core areas and state-of-the-art topics of bioengineering with a strong focus in Engineering Systems; the laboratory placements during the second semester which help students to decide the research area within which they will develop their PhD thesis; as well as the strong interaction between academia, industry and business, make the Bioengineering Systems doctoral program stand out from global peer programs.

PhD Directors

Manuel Nunes da Ponte (FCTUNL) mnp@dg.fct.unl.pt

Bruce Tidor (MIT) tidor@mit.edu

Curriculum

Each student in the first year of the doctoral program completes six intensive curricular modules (two weeks each). Four of these modules are mandatory and two others can be selected by the student from a range of optional modules.

After successfully completing the 1st year, all students prepare a thesis proposal as an essential basis for their research. While conducting research, the student will also attend several doctoral seminars. The research work of each PhD student will be supervised by a thesis committee which includes professors and established researchers both from MIT and from the Portuguese participating institutions.

Main research topics

Bioenergy
Bioengineering systems
Bioinnovation
Biomaterials
Biomedical devices
Biopharmaceuticals
Heath care systems
Nanobiotechnology
Neurosciences
Stem Cells, tissue engineering and regenerative medicine

The doctoral program is offered jointly by the following institutions:

New University of Lisbon
Faculty of Science and Technology – FCTUNL
Institute of Chemical and Biologic Technology – ITQB

Technical University of Lisbon
Instituto Superior Técnico – IST-UTL

University of Minho
School of Engineering – UMinho

In collaboration with:
University of Coimbra (UC)
Centre for Neuroscience and Cell Biology – CNCUC

LEADERS FOR TECHNICAL INDUSTRIES PhD
(ENGINEERING DESIGN AND ADVANCED MANUFACTURING)

The increased complexity of modern engineering calls for a kind of engineering leadership that is able to accommodate a combination of technical performance, environmental awareness, and social and political responsibility within a systems perspective. **In the Leaders for Technical Industries (LTI) doctoral program we combine engineering, management, social sciences, innovation, leadership, and systems thinking in a paradigm-shifting approach to the education of new engineering leaders and innovators for technical industries.** The LTI program is strongly grounded in an Engineering Systems approach that couples education and research, and is at the European forefront of doctoral research placements in industry.

The LTI curriculum addresses core areas in product development, in advanced manufacturing, and in industrial management. It was developed jointly by MIT and Portuguese faculty, in many cases by creating entirely new modules never before offered either at MIT or in Portugal, and reflects continuous refinements based on student and faculty assessments. As a fully cooperative program amongst three Portuguese institutions and MIT, a new delivery mechanism has been adopted whereby students rotate through intensive one-week modules at each institution. To enhance the interdisciplinary nature of the program, some modules are intertwined to accommodate a joint project. Two modules in particular – Product Development, and Technology Evaluation and Selection – have a common project in which students combine their acquired knowledge from both subjects to create a new product that combines technical, economical, and social contexts.

All students have the opportunity to conduct a research internship in industry. The internship is a full-time placement of 3 months to 1 year in length, which matches an LTI PhD student with a leading European company, for example Rolls-Royce and Continental. Faculty advisors from Portugal and MIT work directly with the company's research staff to ensure the student's work contributes to industry needs and builds on the skills developed during coursework.

The LTI program aims at training a new generation of leaders for companies with a high technological profile. LTI graduates will foster innovative applications of state of the art knowledge in successful products and/or processes, enabling a new European paradigm in managing product development and production systems.

PhD Directors

Manuel Freitas (IST-UTL) mfreitas@dem.ist.utl.pt

Joel Clark (MIT) jpclark@mit.edu

Curriculum

The doctoral program in Leaders for Technical Industries (LTI) includes a curricular part, industrial internships and a doctoral thesis.

Main research topics

Smart medical devices
In-vehicle power systems
Lightweight materials and structures
Integrated cost and life-cycle analysis in engineering design manufacturing
Social and human aspects in engineering design and manufacturing
Sustainable solutions in engineering design manufacturing

The doctoral degree is offered in association by the following institutions, with the support of MIT:

Technical University of Lisbon
Instituto Superior Técnico – IST-UTL

University of Minho
School of Engineering – UMinho

University of Porto
Faculty of Engineering – FEUP

SUSTAINABLE ENERGY SYSTEMS PhD

The doctoral program in Sustainable Energy Systems (SES) focuses on core areas of energy systems within a multidisciplinary engineering systems framework, including engineering and economics, policy, technology, and control and management solutions necessary to design and implement alternative energy strategies, all at the level of energy systems analysis and design.

Program leaders use a multi-disciplinary approach to educate a new generation of sustainability-aware leaders with expertise in energy systems and economics. Students have the opportunity to learn about the practical application of energy strategies through real-world case study research, together with corporate and industry partners, and other institutional affiliates. With this training, they will be able to analyze systems and their interrelations, develop research activities and tackle highly complex problems concerning the energy-environment dynamics. Such professionals are still rare in Europe and elsewhere but are essential to move towards more efficient and environment friendly energy supply and demand systems in the future.

SES students are trained to play leadership roles in implementing sustainable energy policies and developing new business opportunities, namely to:

- create new knowledge through R&D, promoting innovative product development and technology integration of sustainable energy systems, in which energy demand will be fulfilled with minimum use of non-renewable natural resources, while taking into account the diversity of resource availability and socio-economic circumstances across the globe;
- promote new forms of interaction between universities, private enterprises, government, and civil society for identifying and implementing sustainable energy policies and technology innovation; and
- establish markets for new energy technologies, clarifying the role of industrial and government policy in directing pathways to future energy sustainability, and by providing leadership in these sectors to serve as agents of change, with an emphasis on entrepreneurship.

PhD Directors

João Peças Lopes (FEUP) jpl@fe.up.pt

David Marks (MIT) dhmarks@mit.edu

Curriculum

The program includes one year of coursework and a doctoral dissertation in the following areas:

Energy planning and policy
Sustainable built environment
Smart energy networks

All participating universities share a common core curriculum, and students can personalize their program by selecting elective modules at any of the five schools that meet their specific interests and program requirements, as described in the diagram.

Main research topics

Design of sustainable, smart and efficient energy systems
Energy and environmental economics
Energy efficiency and pathways for sustainability
Energy in buildings
Renewable energy resources Integration
Smart Grids, microgrids and vehicle to grid
Sustainable energy technologies: Carbon Capture and Storage, ocean energy, bio-energy
Sustainable Urban Systems
Urban Metabolism

The SES Doctoral Program is a joint initiative of the following Portuguese institutions, with the support of MIT:

Technical University of Lisbon
Instituto Superior Técnico – IST-UTL
Instituto Superior de Economia e Gestão – ISEG-UTL

University of Coimbra (UC)
Faculty of Economy – FEUC
Faculty of Sciences and Technology – FCTUC

University of Lisbon
Faculty of Sciences – FCUL

University of Porto
Faculty of Engineering – FEUP

TRANSPORTATION SYSTEMS PhD

The transportation needs of contemporary societies are greater than ever before in history, raising challenges and requiring solutions that only researchers and professionals properly trained in the design and management of technology-intensive, intermodal transportation systems can tackle successfully.

The goal of the PhD program in Transportation Systems (TR SYS) is to prepare such researchers and professionals for careers in academia, public- and private-sector companies, and government entities. **The students will advance their knowledge, skills and competencies for developing research and analyzing new and complex concepts, promoting technological, social, and cultural progress both in academic and professional contexts.**

The program encompasses virtually all transportation infrastructures and modes/services, under a wide variety of perspectives and approaches. This provides a solid scientific education which covers both methodological approaches and the institutional factors required to understand the transportation enterprise as an intermodal integrated system.

The students have the opportunity to work with MIT and Portuguese faculty on cutting-edge research to develop new world-class transportation systems for passengers and freight. Close collaboration with industry and government, both in teaching and research, offers an important added value to this program: recent research participants include high-speed rail operator RAVE and infrastructure developer BRISA.

Linked with these prominent research partners and highlighted in the most recent global conference of transportation researchers, the international profile of the TR SYS doctoral program has been established. **The program attracts an increasing number of highly-qualified candidates from around the globe, in particular from Eastern Asia, the Middle East, Africa, and North and South America.**

PhD Directors

António Pais Antunes (FCTUC) antunes@dec.uc.pt

Richard De Neufville (MIT) ardent@mit.edu

Curriculum

In the first year, each student must complete the mandatory module and four other elective modules. At the end of the coursework the student must prepare a thesis proposal which must be approved by a thesis committee before s/he can start her/his doctoral research.

Main research topics

Airport systems
High speed rail systems
Innovative congestion management
Innovative traveller information
Intelligent transport systems
Risk assessment of complex systems
Sustainable mobility for passengers and freight
Transportation, land use and urban revitalization

The Transportation Systems (TR SYS) doctoral program is offered in association by the following institutions, with the support of MIT:

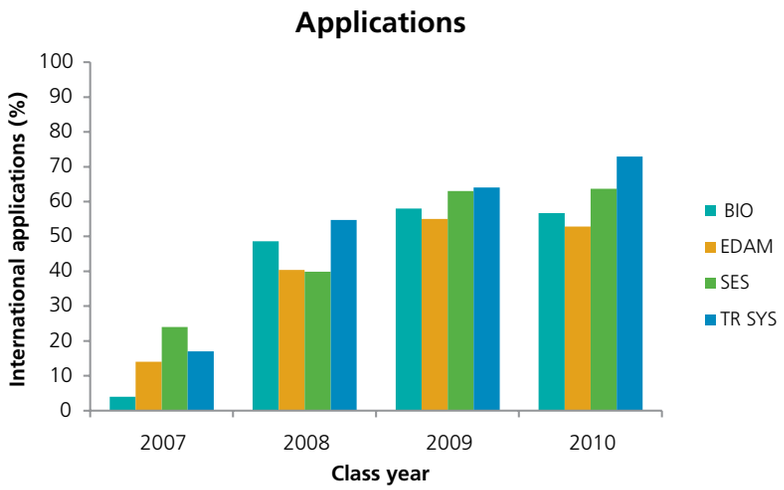
Technical University of Lisbon
Instituto Superior Técnico – IST-UTL

University of Coimbra (UC)
Faculty of Science and Technology – FCTUC

University of Porto
Faculty of Engineering – FEUP

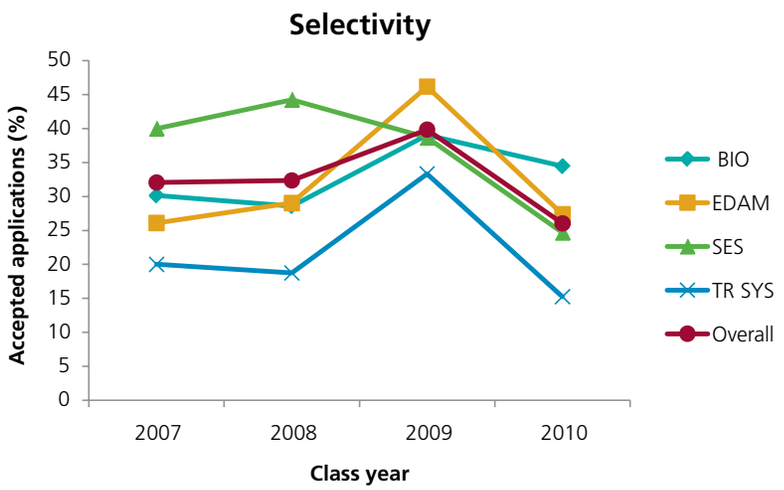
MAIN INDICATORS

The doctoral programs have shown an increasing number of international applications. In 2010 60% of the applications were from outside Portugal, from 55 different countries.



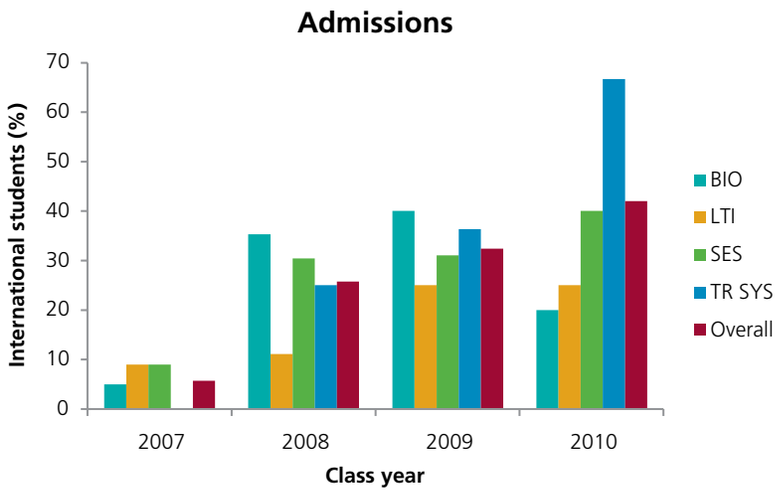
Proportion of international applications to the MIT Portugal doctoral programs over the academic years 2007-2010

Students are selected through a very rigorous admissions process. On average, only 26% of those who apply are admitted. Many of our students come from world leading academic institutions, such as MIT, Imperial College London, University of Michigan and ETH Zurich, and some also bring prior experience in international organizations, e.g. Volvo Sweden, PriceWaterhouse Coopers, the Office of the Prime Minister of France, and the World Resources Institute.

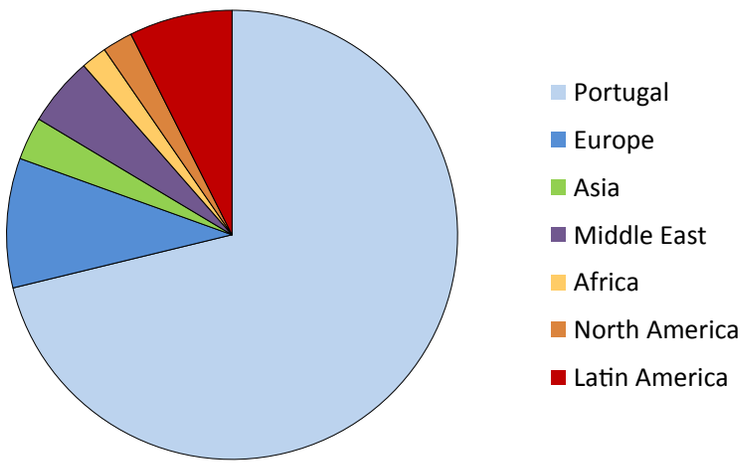


Proportion of selected applications for the MIT Portugal doctoral programs over the academic years 2007-2010

The proportion of admitted international students has increased significantly over the 4 years existence of the Program. In 2010 42% of the total admitted PhD students to the MIT Portugal Program were from outside Portugal, from a range of 39 countries. This multicultural and vibrant working environment enhances professional networking and collaborations, while also enriching the personal development of our PhD students.



Proportion of admitted students to the doctoral programs of the MIT Portugal Program from outside Portugal, over the academic years 2007-2010



Doctoral students' geographical origin

In the following pages we present the profiles of our students for the academic years of 2007 to 2009.

OUR STUDENTS

MIT Portugal

Bioengineering Systems

> 2007/2008

Agnieszka Joskowiak

Bioengineering Systems PhD
IST-UTL
Country: **Poland**
Background: **Biotechnology, Poznan University, Poland**
Starting Year: **2007/2008**
Supervisor: **Joao Pedro Conde (IST-UTL)**

Integration of light sensor arrays with microfluidic networks to scale down 2D fluorescence spectroscopy for high throughput organism/cell condition analysis

The main objective of the thesis is to establish a lab-on-a-chip equivalent of two-dimensional fluorescence spectroscopy (2D FS) method. Two-dimensional fluorescence spectroscopy (2D FS) is a fast, highly sensitive and non-invasive method that allows the assessment of cell conditions by focusing on their intrinsic "fluorophores" – aromatic amino acids, vitamins and other cofactors. Miniaturization of the method allows for significant sample volume reduction and opens new application possibilities.
The major tasks addressed in the work include: studies of proper biological model with large-scale equipment, photodiodiode sensor fabrication, characterization and optimization; filter design and characterization; self-assembly studies to enable automatization of matrix design and microfluidic structure development and final integration of the whole system.

Ana Fernandes-Platzgummer

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biological Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Cláudia Lobato da Silva (IST-UTL), Joaquim Sampaio Cabral**

Three-dimensional Culture: another dimension for the ex-vivo expansion and neural differentiation of embryonic stem cells

The overall purpose of this project is to develop scalable and controllable production-scale culture systems for the ex-vivo expansion and neural differentiation of embryonic stem (ES) cells, providing new perspectives for a multitude of potential cell therapies and in vitro studies (e.g. biological, toxicological).

Ana Rosário

Bioengineering Systems PhD
FCTUNL
Country: **Portugal**
Background: **MSc. Microbiology, ESB-UCP, Portugal**
Starting Year: **2007/2008**
Supervisors: **Margarida Archer (FCTUNL), Li-Huei Tsai (MIT)**

Regulation of Synaptogenesis by Shank3: a biochemical and structural analysis

The goal of the project is to test the central hypothesis that Cdk5 is a major effector of the NMDA receptor pathway that facilitates activity-dependent regulation of synaptic plasticity by phosphorylating synaptic proteins involved in spine/synapse development and by unrevealing the structural interaction between those proteins. Identification of these substrates and interactions should help understand the signaling network whereby neuronal connectivity and brain circuits are regulated. Information provided by this research may also shed light on potential targets for therapeutic interventions of autism.

Ana Silva

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biotechnology Engineering, University of Algarve, Portugal**
Starting Year: **2007/2008**
Supervisor: **Guilherme Ferreira (IBB-UAlgarve)**

Acoustic Biosensors for Biomedical and Biotechnology Applications

The general objective of this project is to develop acoustic biosensors devices both SAW (surface acoustic wave) and QCM (quartz microbalances) for quantitative recognition of unlabeled analytes. These mass-sensitive electroacoustic devices have already proven to be suitable detectors for biosensing applications. Two different line of research are to be conducted: the development of the sensor which aims the research and optimization of all the aspects involved in the use of acoustic sensors (sensor physics, signal acquisition, sensor/biomolecule interface) and the sensor applications which aim to study the molecular and kinetic determinants of biorecognition and the development of these sensors for specific applications (interaction of antibodies and virus, cytochromes substrate and inhibitor binding or PXR activity regulation).

Carlos Machado

Bioengineering Systems PhD
UMinho
Country: **Portugal**
Background: **MSc. Mathematics and Computer Science, University of Minho, Portugal**
Starting Year: **2007/2008**
Supervisors: **Eugénio Ferreira (UMinho), Isabel Rocha (UMinho), Bruce Tidor (MIT)**

Application of Optimal Experimental Design Techniques in the context of Systems Biology

Whole-cell modeling is an ultimate goal for Systems Biology and can bring major benefits to areas such as drug development and biotechnological production processes. This will require the integration of different types of biological networks (metabolic, regulatory and signaling). Such integration would benefit from the creation of a common modeling framework that takes into account different entities and their relationships. This work focuses on the development of a framework to integrate regulatory and metabolic networks for Metabolic Engineering applications using E. coli as a case study. As such, a review of modeling formalisms used in Systems Biology to model biological processes will be selected for the development of a common modeling framework where the models of E. coli used in our group will be implemented. Afterwards, tools for model analysis and integration with other formats will be developed. Finally, the improved models developed in this framework will be tested and validated in bench-scale bioreactors.

Carlos Rodrigues

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biological Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Joaquim Cabral (IST-UTL), Claudia Lobato da Silva (IST-UTL)**

Design and operation of bioreactor systems for the expansion and controlled neural differentiation of stem cells

The main goal of this project is the development of a bioreactor platform for the controlled and reproducible large-scale expansion and/or differentiation of mouse embryonic stem (mES) cell-derived neural stem (NS) cells and human embryonic stem (hES) cells. The main tasks are the optimization of mNS and hES cell expansion and differentiation under static culture conditions and the subsequent development of controlled bioreactor systems for the same purposes. Different bioreactor configurations will be evaluated, using selected scaffolds to support cell adhesion. Cell cultures will be characterized in terms of cell fold increase, viability, growth rate, metabolic profile and expression of specific cell markers.

Cláudia Vistas

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biotechnology Engineering, University of Algarve, Portugal**
Starting Year: **2007/2008**
Supervisors: **Guilherme Ferreira (IBB-UAlgarve), João Conde (IST-UTL)**

Optical Nanosensors based on Semiconductor nanocrystals and metal nanoparticles for biomedical applications

The establishment of novel methodologies to link biomolecules to metallic and semiconductor materials to generate biologically active nanoparticles constitutes an important issue in Medical Bioengineering, particularly in generating optical nanosensors for imaging and detection of molecular interactions both in vivo and in vitro. In this project, novel approaches are developed for molecular recognition using Ressonant Energy Transfer (RET) between quantum dots (QDs) and gold nanoparticles (AuNPs). The general objective of this proposal is to use QDs and AuNPs in biorecognition analysis and identification. As such, the fundamental understanding of the QDs/AuNPs interaction is pursued. Synthetic oligonucleotides, PCR amplicons, and antibody/antigen pairs are used as model biosystems to develop the generic QDs/AuNPs sensing methodology and to settle-up prototype nanosensors with potential biomedical applications.

Cristiana Paulo

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biochemistry, University of Coimbra, Portugal**
Starting Year: **2007/2008**
Supervisor: **Lino Ferreira (CNCUC)**

Antimicrobial nanocoatings

Microbial biofilms are formed when microorganisms irreversibly adhere to any moist surface and produce extracellular components that facilitate adhesion and provide a structural matrix. The design of materials that mitigate or prevent microbial colonization or infection with subsequent biofilm formation would be beneficial in several areas including medicine, environment and textiles, especially because such materials with specific and efficient microbial properties currently do not exist. The objective of the PhD is to develop durable antimicrobial materials for application in indwelling medical devices.

Daniela Coutinho

Bioengineering Systems PhD
UMinho
Country: **Portugal**
Background: **MSc. Biomedical Engineering, University of Minho, Portugal**
Starting Year: **2007/2008**
Supervisors: **Nuno Neves (UMinho), A. Khademhosseini (MIT)**

Micro/Nano-processing strategies as a tool to clarify surface mediated biological performance of degradable biomaterials

Biodegradable polymeric scaffolds and stem cells are two key items in tissue engineering (TE) strategies for the regeneration of tissue defects. Recently, an increasing research effort has been devoted towards the design and development of nano-structured biodegradable polymers, since natural tissues and the associated extracellular matrices are composed of nano-structured materials. The main objectives of this PhD program are focused on strategies for controlling the stem cell response to biodegradable polymers through the design of innovative micro/nano-engineered structures and surfaces.

Daniela Couto

Bioengineering Systems PhD
FCTUNL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, University of Minho, Portugal**
Starting Year: **2007/2008**
Supervisors: **Luis Lages (FCTUNL), Pedro Saraiva (UC), Charles Cooney (MIT), Luís Perez-Breva (MIT)**

Pharma and medical devices: Opportunities arising from convergent technologies

This project will focus on the combination products arising from the pharmaceutical and medical devices industries. Combination products result from the convergence of technologies and joint efforts of healthcare industries. The main goal of this work is to recognize opportunities for new healthcare ventures to enter the market in the convergence of technological streams. Policy makers, entrepreneurs, and Pharma and medical devices companies will benefit from this study.

David Malta

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biological Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Joaquim Sampaio Cabral (IST-UTL), Cláudia Lobato da Silva (IST-UTL), Sangheeta Bhatia (MIT)**

Depicting the bone marrow microenvironment towards the ex-vivo expansion of human stem cells

The current project aims to contribute to a better knowledge of the hematopoietic niche towards the development of novel strategies for the ex-vivo expansion of human hematopoietic stem/progenitor cells (HSC) to generate clinically relevant cell numbers from the available donor samples. By employing both mesenchymal stem cell (MSC)-derived stromal cells and cytokines to recreate the stem cell niche, we envisage the development of a successful platform for the expansion of umbilical cord blood (UCB) HSC, making UCB transplantation in adults more widely available.

Débora Ferreira

Bioengineering Systems PhD
UMinho
Country: **Portugal**
Background: **MSc. Biomedical Engineering, University of Minho, Portugal**
Starting Year: **2007/2008**
Supervisors: **Graça Minas (UMinho), M.Feld (MIT)**

New functions of the Endoscopic Capsule

This project proposes the integration of new functions on the endoscopic capsule (EC) that can dramatically improve early detection of gastrointestinal (GI) cancers. The main technological innovation is the take-up and integration of microsystems on an EC for spectroscopic clinical assessment of GI tract tissue. The work plan has two phases. On the first phase, it will be developed a spectroscopy system to provide information about biochemical and structural tissue attributes, from which diagnostic algorithms to differentiate dysplasia from normal tissue can be developed; on the second phase, the design and fabrication of CMOS optical sensors for spectroscopy measurements, based on the previous clinical studies, and microsensors for monitoring some physiological parameters will be integrated in a single lab-in-a-pill format.

Eunice Costa

Bioengineering Systems PhD
FCTUNL
Country: **Portugal**
Background: **MSc. Biological Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Ana Aguiar Ricardo (FCTUNL), Paula Hammond (MIT), Linda Griffith (MIT)**

Bioactive Beads for Local Modulation and Sensing of Cell Mechanical Environment in 3D Engineered Tissues

The PhD project focuses on the development of cell-sized hydrogel beads with defined and systematically varied mechanical properties and cell interactive surface properties. These beads will be incorporated into 3D tissue structures as pseudo-cells to provide local modulation of cell behavior (via controlling local mechanics for neighboring cells) as well as recording key aspects of cell physiology through special reactive moieties buried within the surface coating. The artificial cells will be synthesized using a green chemistry approach.

Isa Monteiro

Bio-Engineering Systems Doctoral Program
UMinho
Country: **Portugal**
Background: **MSc. Biomedical Engineering, University of Minho, Portugal**
Starting Year: **2007/2008**
Supervisors: **Rui Reis (UMinho), Alexandra Azevedo (UMinho), Paula Hammond (MIT)**

Development of a novel Regenerative Medicine Approach to treat Skin Defects

This PhD project focuses on the development of a Tissue Engineering approach to create epidermal and dermal equivalents based on natural biomaterials, adult stem cells (SCs) and controlled delivery of specific bioactive agents that play active roles in wound healing. The creation of skin-like constructs will be pursued by exploring co-cultures strategies to obtain complex tissue substitutes that can promote functional epidermal and dermal regeneration and induce faster vascularization of the dermal component. The functionality of the skin-like tissue created in vitro will be ultimately tested in vivo in suitable full thickness wounds models.

Isabel Ferreira

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biological Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Raquel Barros (IST-UTL), Daniel IC Wang (MIT)**

Bioprocess Engineering on Microbial Desulfurization: Cell Immobilization and Cell Recycle for Desulfurization of Crude Oil

The new regulations to lower sulfur content in fossil fuels require new economic and efficient methods for desulfurization of recalcitrant organic sulfur. This research work is on biodesulfurization, BDS, a process that uses microorganisms as the catalyst for fuel desulfurization. The project aims at the design of a microbial desulfurization bioreactor that is both technically and economically feasible ensuring that its operations are scalable for commercial production and manufacturing. The experimental research consists of the screening of immobilization methods for bacterial sulfur removal and evaluation of the use of immobilized cells and cell recycling in a bioreactor for the successful desulfurization of crude oil. Several bacteria strains such as Rhodococus erythropolis, will be tested. Finally, batch and continuous bioreactor operation parameters using immobilized cells and cell recycle will be tested.

João Guerreiro

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biological Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Joaquim Cabral (IST-UTL), Claudia Lobato da Silva (IST-UTL), Daniel Anderson (MIT), Robert Langer (MIT)**

Skeletal Muscle Differentiation of Human Mesenchymal Stem Cells (MSC) via Non-Viral Gene Delivery for Therapeutic Applications

The project aims to demonstrate the feasibility of using human mesenchymal stem cells (MSC) as a source of skeletal muscle cells. By taking advantage of recently non-viral gene delivery solutions that provide high transfection efficiencies it is aimed to identify and activate relevant genes from the myogenic development pathway in order to promote MSC differentiation. Such activation combined with the rapid expansion capacity of MSC ex-vivo would allow the generation of a large number of skeletal muscle cells in a relatively short period of time paving the way for a wide range of therapeutic applications namely using autologous cells.

Maria Orey

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Miguel Tavares da Silva (IST-UTL), Dava Newman (MIT)**

Multibody dynamics and control of hybrid active orthoses

One of the current challenges in the creation of prosthetic and orthotic devices is the question of portability. This project aims at the creation of an active ankle foot orthosis for which the problem of portability is no longer an issue. Using functional electrical stimulation (FES) as a means of harnessing energy from the patient's own muscles for actuation, a lower energy requiring orthosis is to be designed to promote not only locomotion as well as muscular rehabilitation. This PhD is part of the MPP Project "DACHOR – Multibody Dynamics and Control of Hybrid Active Orthoses". The major milestones of this project are the multibody dynamics analysis of the global musculoskeletal dynamics of an integrated model of the patient carrying an orthosis; the development of a hybrid actuation solution with dynamic scaling of the control authority between FES and mechanical actuation; and the development of an adaptive control law that automatically regulates, by means of on-line identification of muscle contraction dynamics, the amount of support to be provided by the orthotic device.

Mariana Fernandes

Bioengineering Systems Doctoral Program
UMinho
Country: **Portugal**
Background: **MSc. Biomedical Engineering, University of Minho, Portugal**
Starting Year: **2007/2008**
Supervisors: **Higino Correia (UMinho), Rajeev Ram (MIT)**

Wireless Wearable Braincap

The main goal of this work is to develop a new generation of contactless electrodes that will avoid the use of gel and complex attachment procedures, and will enable the integration within a wearable Brain Cap. The main target of this device is the monitoring of brain activity (e.g. epileptic and neurological disease patients) and brain-computer interface applications.

Pedro Andrade

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biological Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Cláudia Lobato da Silva (IST-UTL), Joaquim sampaio Cabral (IST)**

Novel Approaches for the Isolation and ex-vivo Expansion of Hematopoietic Stem Cells from Human Umbilical Cord Blood for Cell Therapy

This project aims at the development of novel strategies for the isolation and ex-vivo expansion of human hematopoietic stem cells (HSC) from umbilical cord blood (UCB) for use in multiple settings such as cell therapy (e.g. BM transplantation) or gene therapy.

Rui Tostões

Bioengineering Systems PhD
FCTUNL
Country: **Portugal**
Background: **MSc. Applied Chemistry, FCT-UNL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Paula Alves (ITQB-UNL), João Paulo Crespo (FCTUNL), Daniel IC Wang (MIT)**

High Through-Put Screening with Microbioreactors

The main objectives of this PhD project are: the establishment and validation of a perfusion bioreactor for long-term primary culture of alginate encapsulated functional hepatocyte aggregates; the validation of the mentioned bioreactor for the study of in vitro liver-specific metabolism of new chemical entities; the development of fluorescence-based techniques for monitoring viable cell number, functionality and drug induction of primary hepatocyte aggregate culture and the establishment of a high throughput microbioreactor platform for long-term culture of functional primary cultures of hepatocytes in aggregates and in vitro, non-invasive, study of liver-specific metabolism of new chemical entities.

Tatiana Aguiar

Bioengineering Systems PhD
UMinho
Country: **Portugal**
Background: **MSc. Pharmacy (ESTSP) and Biotechnology, University of Minho, Portugal**
Starting Year: **2007/2008**
Supervisor: **Lucília Domingues (UMinho)**

Novel Biotechnological applications for riboflavin producer

This work plan fits one general goal, that is to develop A. gossypii as a recombinant protein production "platform". With that aim we will focus on antibody and their fragments production as there is soon expected to be a total production demand in the range of multi-tons per year. The large scale production of antibodies and fragments is required and hence there is a profound interest to seek for alternative production systems. The engineering of Ashbya is envisaged for efficient antibody production using "omics analysis". The plan was designed in such a way that while testing for different genetic and environmental conditions that enhance recombinant antibody production, systems-wide-omics analysis will be conducted, allowing us to get insight on the Ashbya metabolism and physiology and use this information latter to design strategies for further improvements.

André Fialho

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **João Sousa (IST-UTL), Stan Finkelstein (MIT)**

Systems redesign to improve the survival of critically Ill patients

Severe sepsis remains a leading cause of death in industrialized countries, and its number is increasing despite improved survival rates. Recently, a variety of new tools and machine learning techniques, such as artificial neural networks and fuzzy systems, have been proposed, with claims of improved performance to predict short-term and long-term outcomes of critical illness. In the project proposed here, the data collected in the intensive care unit (ICU) of two important Hospitals (Beth Israel Deaconess Medical Center, Boston and Hospital da Luz, Lisbon) will be carefully analysed and processed by using these techniques. The main goal is to be able to predict, within suitable confidence limits, which patients will experience this adverse outcome – sepsis – in the context of the ICUs' system. Further, this work intends to re-design the associated interventions in order to achieve more favourable clinical outcomes.

António Vicente

Bioengineering Systems PhD
FCTUNL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, FCTUNL, Portugal**
Starting Year: **2008/2009**
Supervisor: **Rodrigo Martins (FCTUNL)**

Development of Nanomorphous Solar Cells in Ceramic Substrates with Biomedical Application

The present research project aims at the development and fabrication of nanomorphous silicon solar cells deposited in ceramic substrates for biomedical and industrial applications, namely field hospitals. It is the main goal to investigate the creation of integrated photovoltaic ceramics of high efficiency to coat infrastructures that encompass, from root and by modification, silicon thin film solar cells, with a specific architectural design and a bioengineering application. As an alternative to the traditional micromorphous "tandem" solar cells, a novel and innovative solution to the low efficiency solar cells will be explored by using new deposition conditions, disruptive relatively to the traditional ones. It is also pretended to replace the amorphous n-i-p structure by a nanostructured n-i-p structure that can be polymorphous or protocrystalline silicon. The obtained and tested cells will then have a bioengineering application applied to a field hospital with the objective of improving the number and quality of the services provided, through study and assessment of the major necessities in terms of energy and drawbacks of the current available structures. An architectural structure will be also designed in order to implement the solar cells with the main goal of optimizing the used space and maximizing the energy harvesting.

Fabiana Fernandes

Bioengineering Systems PhD
FCTUNL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, University of Minho, Portugal**
Starting Year: **2008/2009**
Supervisors: **Paula Alves (ITQB-UNL), Kristala Prather (MIT)**

Novel Cell Factories for the production of complex bioproducts: a synthetic biology approach for improved product stoichiometries

Animal cell technology is often the preferred platform used in biopharmaceutical manufacturing scenarios. However, the large costs associated with this production platform makes mandatory further improvements in product yields. The production yields of such complex bioproducts depend not only on high expression of each of the monomeric protein subunits but also on their correct stoichiometric expression. The breakthrough in this project will be the development of a new cell line, the cell factory Sf9 Multiflex, integrating a high level of expression control for each protein component. A fine-tuning of the product stoichiometry will be accomplished by bridging synthetic biology and molecular biology approaches, namely by combining synthetic genetic circuits and recombinase exchange technology. Our main goal is to establish a flexible insect cell line able to produce different multi-component biopharmaceuticals with an appropriate stoichiometry between components.

Federico Cismondi

Bioengineering Systems PhD
IST-UTL
Country: **Argentina/Italy**
Background: **MSc. Bioengineering, San Juan National University, Argentina**
Starting Year: **2008/2009**
Supervisors: **João Sousa (IST-UTL), Stan Finkelstein (MIT)**

Systems support for clinical process change using data based modeling

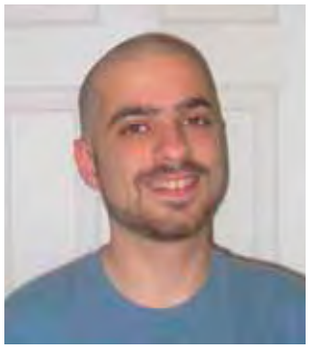
In this project, high-dimension data sets collected in Intensive Care Units (ICUs) will be examined and considered to optimize the scheduling and the use of resources in patient's health care. It is expected to use different types of machine learning strategies in order to automatically identify critical events in patients mechanically ventilated, and then link them to specific prior interventions, that could lead to a self-extubation state. Self-extubation is a marker for an agitated state that can develop abruptly, can be intermittent, and when present, can fluctuate in severity over time. Given the high risks associated with agitation and self-extubation, it is expected to predict which patients within an Intensive Care Unit (ICU) population are at risk for the condition and detect early warning signs. This would enable clinicians to implement mitigation strategies, adjust treatment, or allocate resources appropriately to prevent adverse events. Achieving these aims will require detailed and intelligent analysis of large volumes of physiological, demographic and clinical process data.

Filipa Castro

Bioengineering Systems PhD
UMinho
Country: **Portugal**
Background: **MSc. Biological Engineering, University of Minho, Portugal**
Starting Year: **2008/2009**
Supervisors: **José Teixeira (UMinho), António Vicente (UMinho)**

Novel application of an oscillatory flow reactor (OFR): production of Hydroxyapatite and its use for the growth of bone extracellular matrix

Hydroxyapatite (HA) is extensively used in biomedicine e.g. to replace and mimic bone, given that the cell growth around it improves when HA crystals have a high specific surface area (favoured by small crystal sizes), once this contributes positively to the amount of adhered cells per unit volume of the material. Based on the economic and scientific relevance of these biomaterials in question, the project aims at the adaptation of a novel oscillating flow reactor (OFR) for the production of HA crystals with controlled size and size dispersion that render them suitable for application e.g. in bone replacement. The work plan will be focused on the evaluation of the novel OFR for cell growth (in the absence of HA), the application of the novel OFR for cell growth in the presence of HA crystals and the optimization of the reactor operating parameters.



Filipe Grácio

Bioengineering Systems Doctoral Program
IST-UTL
Country: **Portugal**
Background: **MSc. Biological Engineering, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **Joaquim Sampaio Cabral (IST-UTL), Bruce Tidor (MIT)**

Synthetic Biology of Stem Cells

This work is part of a broad scientific effort whose long term vision is the possibility of understanding and controlling stem cell behavior. Specifically it is intended to address the problem of generating Stem Cells from adult Somatic Cells. The current protocols present two major problems: they are inefficient (only 2% yield) and slow (two weeks or more until results). Often, the existence of "stochastic events" is said to be a major contributor to these problems. The plan is to study the role of stochastic effects in the process and it will be divided in the following aims: build a model of the process of reprogramming at the molecular level, study the model parameter space and use the model to infer about the mechanism and role of stochasticity. Mathematical tools that take stochastic effects into account will be used to simulate the system. The goal is to understand the particular contribution of the various factors and identify key points of the process.

Geisa Gonçalves

Bioengineering Systems PhD
IST-UTL
Country: **Brazil**
Background: **MSc. Biochemical Engineering, University of São Paulo, Brazil**
Starting Year: **2008/2009**
Supervisors: **Duarte Miguel Prazeres (IST-UTL), Gabriel Monteiro (IST-UTL), Kristala Prather (MIT)**

Rational engineering of E. coli strains and vectors for improved manufacturing of plasmid biopharmaceuticals

The overall goal of this project is to develop and test an E. coli strain specifically adapted to meet the upstream and downstream processing challenges associated with large-scale production of plasmid vectors. By rationally engineering specific genes we aim to deliver a host capable of striving in high-density cell cultures while synthesizing large amounts of supercoiled plasmids at a high plasmid/impurity ratio. Newly developed strains will be evaluated for use with vectors, more nuclease resistant, which are being optimized by the IST group for improved in vivo stability. Additionally, the utility of new kinds of vectors to improve the specific and volumetric yields of pDNA fermentations will be explored. The impact of the new strain and vector designs on the downstream processing, final plasmid quality and process economics will be assessed.

João Arrais

Bioengineering Systems Doctoral Program
FCT-UC
Country: **Portugal**
Background: **MSc. Pharmaceutical Sciences, University of Lisbon, Portugal**
Starting Year: **2008/2009**
Supervisors: **João Moreira (CNCUC), Helena Marques (FFUL), Robert Langer (MIT), Omid Farokzhad (MIT/HMS)**

Engineered nanoparticles for targeted drug delivery in cancer therapy

The main objective of this work is to develop engineered nanoparticles for cancer therapy. Similar molecules have been developed in the recent years and have shown a higher therapeutic index comparing to the administration of the corresponding drugs alone. The rational design/development of new modified drug delivery systems will be explored and the research will focus on understanding of the interaction of these systems/nanoparticles at the microenvironment and intracellular level, for the specific tumor type at hand, as well as developing/improving delivery systems that can ultimately add value for patients through an appropriate integration with existing/current therapeutic alternatives. Attention will be drawn to the properties that are critical to make these systems suitable for administration and optimized therapeutic effect.

Jorge Carvalho

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biological Engineering, University of Algarve, Portugal**
Starting Year: **2008/2009**
Supervisor: **Guillherme Ferreira (IBB-UAlgarve)**

Use of Acoustic Biosensors for screening and measuring binding of biomolecules to multimodal chromatography ligands

This PhD project aims at using acoustic wave biosensors to screen the interaction of biomolecules with immobilized ligands and to assess and model the binding mechanism. We rely on the differentiation of signals occurring during biomolecule binding by deconvoluting the signal obtained upon measuring acoustic wave propagation properties. In particular we expect on using the variations in the resistance and resonance frequency of quartz crystal sensors, and their correlation to the biofilms' viscoelasticity and mass, in order to visualize and measure the conformational changes induced by the ligands upon biomolecule adsorption.

Maria Eiriz

Bioengineering Systems PhD
FCT-UC
Country: **Portugal**
Background: **MSc. Biochemistry, University of Porto, Portugal**
Starting Year: **2008/2009**
Supervisors: **João O. Malva (CNCUC), Carlos Loiz (MIT)**

Neurogenesis in the hippocampus: Histamine and AMPA facilitate differentiation and synaptic integration of new neurons

In the adult mammalian brain, neurogenesis occurs in the hippocampus. Neural stem progenitor cells present in that region possess proliferative and self-renewal capacities and are able to generate neuronal cells. Upon an injury, these cells represent a source of repairing cells with the potential to be recruited into the lesion site and differentiate in the appropriate cell phenotype. This neurogenesis is influenced by glutamatergic signalling during neuronal differentiation. The global aim of the project is to investigate the hippocampal neurogenic niche upon histamine and AMPAkines simulation. Adult neurogenesis' changes will be addressed by phenotic, funcitonal and molecular approaches. With the present work, the properties of hippocampal neural stem cell will be explores as endogenous sources of new neurons, either to treat memory or cognition deficits. Moreover, this project will contribute with data useful for novel drug targets design to boost endogenous neurogenesis in the hippocampus.

Maria Pereira

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Pharmaceutical Sciences, University of Coimbra, Portugal**
Starting Year: **2008/2009**
Supervisors: **Lino Ferreira (CNCUC), Joaquim Cabral (IST-UTL), Jeffrey Karp (Harvard Medical School)**

Development of a Cardiac Patch for Biomolecule Delivery

This projects aims at developing a cardiac patch to release therapeutic doses of cardioprotective biomolecules. Myocardial infarction is one of the leading causes of mortality in the contemporary world. Many patients who survive a myocardial infarction develop a chronic form of heart disease that is associated with a progressive deterioration of the heart muscle and ischemia. Recent clinical data indicate that cardiac function may be improved by the intravenous or intraperitonial administration of bioactive agents that induce the mobilization of stem cells. Unfortunately, most of these bioactive agents have undesirable side effects and very often multiple doses are required for therapeutic effect. We hypothesize that the localized controlled delivery of these biomolecules at the heart might extend the window of cardioprotection while preventing side effects.

Paulo Melo

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, FCTUNL, Portugal**
Starting Year: **2008/2009**
Supervisors: **Miguel Silva (IST-UTL), Jorge Martins (IST-UTL), Dava Newman (MIT)**

Development of a functional electrical stimulation system prototype to aid locomotion in individuals with motor impairments

The aim of this project is the integration of advanced multibody dynamics methodologies, control strategies and Functional Electrical Stimulation (FES) to devise and validate a FES system prototype. This device will promote locomotion and rehabilitation of the lower limbs' musculoskeletal apparatus, in individuals with impaired mobility resulting from neurological conditions such as stroke or spinal cord injury. The project relies on advanced multibody dynamics to perform the analysis of the musculoskeletal apparatus in pathological and non-pathological human gait. A muscle model is to be developed that describes the muscles' kinematics and contraction dynamics, providing information that will allow the design of the FES control architecture. Then a compact, portable (energetically autonomous) prototype device with low power requirements is to be built, so that the patients are able to use it comfortably on a daily basis.

Roberto Marusich

Bioengineering Systems PhD
UMinho
Country: **Chile**
Background: **MSc. Biochemical Engineering, Pontifical Catholic University of Valparaiso, Chile**
Starting Year: **2008/2009**
Supervisors: **Ligia Rodrigues (UMinho), Madalena Alves (UMinho)**

Development of New Strategies for the Production of Butanol

The main objective of this project is to develop an optimal fermentation process to transform low grade glycerol to butanol, by establishing a process optimization in order to improve the production yields and reduce the toxicity of butanol to the producing organisms. Afterwards, the butanol produced can be used as a bio-fuel. This low-grade glycerol, generated as a by-product during the production of plant-oil derived biodiesel, arises as a potential substrate candidate for butanol production, especially as we have more and more crude glycerol being continuously generated from the biodiesel industry. To accomplish the proposed objectives, three different approaches will be considered: pure culture fermentation, defined mixed culture and undefined mixed culture. It is expected to develop energy-based models or butanol producer mixed cultures, and synthetic biology tools will be used in a final stage in order to engineer a model microorganism (Pseudomonas putida) for the production of butanol with improved yield and solvent tolerance as a proof-of-principle.

Sara Matias

Bioengineering Systems PhD
FCTUNL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **Zachary Mainen (ITQB/IGC), Boyle (MIT)**

Monitoring Serotonergic Neuronal Activity in Behaving Rats

Serotonin (5-hydroxytrypamine, 5-HT) is a major neuromodulator critical to a wide range of brain functions and diseases, including depression and anxiety disorders. Most notably, key psychoactive drugs such as anti-depressants are thought to act primarily through serotonergic mechanisms. Paradoxically, the functional role of 5-HT in behavior has remained enigmatic and it is still unclear why 5-HT appears to be so deeply entangled with a number of psychiatric disorders. Also, to study 5-HT function in behavior, one necessary approach is to correlate 5-HT release to specific behavioral conditions or events. Currently, there are significant experimental limitations to achieve this goal. This project proposes to use GCaMP3, a new genetically encoded calcium indicator, to track the activity of 5-HT neurons in behaving rats. It will be able to sample the activity of large populations of 5-HT neurons over long periods of time. This will allow us to test a large battery of stimuli and behavioral conditions, providing a more complete map of behavioral correlate of 5-HT release. This work should yield fundamental new insights into the behavioral functions of 5-HT, both through definitive examination of prominent hypotheses or novel exploratory experiments.

Sezin Aday

Bioengineering Systems Doctoral Program
IST-UTL
Country: **Turkey**
Background: **MSc. Bioengineering, Hacettepe University, Turkey**
Starting Year: **2008/2009**
Supervisors: **Claudia Lobato da Silva (IST-UTL), Lino Ferreira (CNC-UC), Robert Langer (MIT)**

Hematopoietic Stem Cell Niches for Cell Expansion and Vascular Differentiation

Hematopoietic stem cells (HSCs) from umbilical cord blood (UCB) are an important source of differentiated cells for regenerative medicine, in particular of vascular cells. Because HSCs can differentiate into several cell types, the development of platforms to control their final fate would be desirable. However, HSCs are isolated in a relatively low number and thus it is imperative to develop new approaches for their in vitro expansion. The main goal of this project is to develop growth factor-tethered magnetic microparticles to present ligands to UCB HSCs either for cell expansion or differentiation. We hypothesize that the presentation of tethered growth factors to cells might prevent cell uptake and consequent degradation of the growth factor, increase growth factor stability in culture medium, increase the biological effect of the growth factor and prevent endocytosis of growth factor-receptor complexes.

Silvia Mihaila

Bioengineering Systems PhD
UMinho
Country: **Romania**
Background: **MSc. Chemistry & Physics, University of Transilvania of Brasov, Romania**
Starting Year: **2008/2009**
Supervisors: **Rui L. Reis (UMinho), Alexandra Marques (UMinho), Manuela Gomes (UMinho), C. James Fitzpatrick (Johannes Gutenberg University)**

New routes for obtaining vascularized bone tissue engineering constructs

A major hurdle in Tissue Engineering comprises the vascularization of constructs with more than few millimeters in volume. These cannot survive without the formation of new blood capillaries to supply essential nutrients and oxygen, and remove metabolic waste products. A new biomaterial-based strategy will be proposed to target this issue and aiming at promoting vascularization of bone tissue engineered constructs. The coculture of cells derived from the same source and with angiogenic and osteogenic potential, in a 3D scaffold, will constitute the main approach to be followed. Human adipose tissue will be the source of either primary (endothelial cells) or stem/progenitor (mesenchymal and endothelial progenitor cells) cells. The functionality outcomes achieved in vitro will be validated in vivo using appropriate models to assess, in a first stage, the vascularization potential and, at a final stage, vascularised bone formation.

Swarnadeepa Pandian

Bioengineering Systems PhD
IST-UTL
Country: **India**
Background: **MSc. Biotechnology, Madurai Kamarai University, India**
Starting Year: **2008/2009**
Supervisors: **Ramiro Almeida (CNCUC), Ana Luisa Carvalho (CNCUC), Joaquim Sampaio Cabral (IST-UTL), Martha Paton (MIT)**

mGluR-dependent LTD and its regulation in the Visual Cortex by Eye Opening and the Onset of Pattern Vision

Metabotrobic glutamate receptor-dependent long term depression at excitatory synapses is rapidly becoming recognized as an important form of neuroplasticity in hippocampus, cerebellum, and visual cortex. This form of plasticity reduces AMPA glutamate receptors at synapses, and not only triggers, but requires local dendritic protein translation. This LTD is also coupled to the local production of the Fragile X Mental retardation protein. The research project will focus on the visual cortex of the Flailer mouse because in this pathway developmental changes are well established. The goal is to see what post-synaptic proteins, or post-synaptic protein synthesis is altered in the Flailer mouse when the mGluR dependent pathway is stimulated in the visual cortex of this mouse. The long term goal is to determine the role played by mGluR dependent LTD at EO in the visual cortex, to determine whether the increased activity that occurs in this region with eye opening alters mGluR dependent LTD, and if this form of plasticity alters levels of critical synaptic proteins previously associated with mGluR LTD at his time. Subsequent work on Flailer will depend on the changes observed in Flailer vs normal animals in this first phase of the thesis work. Behavioral studies will also be carried out on Flailer mouse with respect to Autism.

> 2009/2010

Ana Domingues

Bioengineering Systems PhD
FCTUNL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, FCT-University of Coimbra, Portugal**
Starting Year: **2009/2010**
Supervisors: **not yet defined**

Research interests

Biomedical devices and technologies (medical electronics and biosensors); cell and tissue Engineering (development of new biomaterials that can be used in medical applications); innovation in bioengineering (both market pull and technology push).

Carlos Boto

Bioengineering Systems PhD
FCT-UC
Country: **Portugal**
Background: **MSc. Materials Engineering, University of Coimbra, Portugal**
Starting Year: **2009/2010**
Supervisors: **Lino Ferreira (CNCUC), João Malva (CNCUC)**

Controlling the Differentiation of Stem Cells by Bioactive Molecules Released from Biocompatible Micro- and Nanotechnologies

Iris Batalha

Bioengineering Systems PhD
FCTUNL
Country: **Portugal**
Background: **MSc. Applied Chemistry/Biotechnology, FCTUNL, Portugal**
Starting Year: **2009/2010**
Supervisors: **Ana Cecília Roque (FCTUNL), Olga Iranzo (ITQB-UNL) and Christopher Robin Lowe (Institute of Biotechnology – University of Cambridge).**

Engineered structures for the profiling and enrichment of the phosphoproteome

Javad Hatami

Bioengineering Systems PhD
IST-UTL
Country: **Iran**
Background: **MSc. Biomedical Engineering, Amirkabir University of Technology, Iran**
Starting Year: **2009/2010**
Supervisor: **Frederico Ferreira (IST-UTL)**

Cell and tissue engineering, biomaterials and stem cells engineering

Joana Coelho

Bioengineering Systems PhD
FCTUNL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, IST-UTL, Portugal**
Starting Year: **2009/2010**
Supervisors: **not yet defined**

Research interests

Modeling and simulation applied to the biomedical field, biomedical devices, medical imaging.

Michaela Simcikova

Bioengineering Systems Doctoral Program
IST-UTL
Country: **Czech Republic**
Background: **MSc. General and Applied Biochemistry, ICT Prague, Czech Republic**
Starting Year: **2009/2010**
Supervisors: **Duarte Miguel Prazeres (IST-UTL), Gabriel Monteiro (IST-UTL), Kristala Prather (MIT)**

Research interests

Genetic engineering, Molecular Biology and Cell and Tissue Engineering. Production of plasmid biopharmaceuticals. Bioengineering connected with cellular therapy or genetically engineered microorganisms or cells to obtain higher yield of target molecule during industrial process.

Mónica Coelho

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, FCTUNL, Portugal**
Starting Year: **2009/2010**
Supervisors: **Joaquim Sampaio Cabral (IST), Jeffrey Karp (Harvard Medical School)**

Research interests

Tissue Engineering as a multidisciplinary field ranging from stem cell biology, biomaterials, biotechnology, and regenerative medicine (innovative methods of tissue reconstruction, based upon knowledge of organ development, using novel "smart" biomaterials, and taking advantage of stem cell engineering, mechanobiology, and electrophysiology approaches).

Nelson Monteiro

Bioengineering Systems PhD
UMinho
Country: **Portugal**
Background: **MSc. Biomedical Engineering, FCTUNL, Portugal**
Starting Year: **2009/2010**
Supervisors: **Nuno Neves (UMinho), Rui Reis (UMinho)**

Highly functional nanofiber-based scaffolds for tissue engineering

Nuno Faria

Bioengineering Systems PhD
FCTUNL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, University of Minho, Portugal**
Starting Year: **2009/2010**
Supervisors: **Not yet defined**

Research interests

Biomaterials and drug delivery; Cell and tissue engineering;
Bio-energy/industrial bioprocesses;
Product development and management.

Paulo Silva

Bioengineering Systems PhD
UMinho
Country: **Portugal**
Background: **MSc. Computer Science, Bioinformatics/ Systems Biology, University of Minho, Portugal**
Starting Year: **2009/2010**
Supervisor: **Isabel Rocha (UMinho)**

Metabolic Control Analysis as a Framework for Strain Optimization

Pedro Evangelista

Bioengineering Systems PhD
UMinho
Country: **Portugal**
Background: **Computer Engineering, FCTUNL, Portugal; Bioinformatics/Systems Biology, University of Minho, Portugal**
Starting Year: **2009/2010**
Supervisors: **Isabel Rocha (UMinho), Eugénio Ferreira (UMinho)**

Systems Biology, Modeling formalisms and metabolic Engineering

The main objectives are the following: creation of dynamic models of cellular processes using distinct formalisms like agent based modeling and mechanistic approaches and apply these models under a Metabolic Engineering context to identify particular set of genetic changes to achieve a specific aim, like the maximization of a certain metabolite concentration in a specific time window.

Rimenys Carvalho

Bioengineering Systems PhD
IST-UTL
Country: **Brasil**
Background: **MSc. Biochemical Engineering, University of São Paulo, Brazil**
Starting Year: **2009/2010**
Supervisors: **Raquel Aires Barros (IST), Steve Cramer (RPI)**

Research interests

Scale-up or development of processes for vaccine production or protein production (hormones, enzymes, etc); bioprocess engineering interfaced with animal cell technology (bioreactors and downstream processing).

Rúben Pereira

Bioengineering Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, IST-UTL, Portugal**
Starting Year: **2009/2010**
Supervisors: **João Sousa (IST), Stan Finkelstein (RPI)**

Research interests

Biomedical devices based on Nanobiotechnology; Biomaterials research to use in cell culture; Biofuels/bio-energy research.

Shantesh Hede

Bioengineering Systems PhD
FCTUNL
Country: **India**
Background: **B.Tech., Pharmaceutical Sciences, University Of Mumbai, India; MSc. Engineering Management, Duke University, USA**
Starting Year: **2009/2010**
Supervisors: **Not yet defined**

Research interests

Innovation in engineering product development (critical aspects of integrated product development with its foundation in engineering). Technology Development and Evaluation for Biomedical Engineering Product Development (e.g. implementation of techniques to design stent grafts to suit existing technical and logistical framework of medical professionals and their services).

MIT Portugal

Leaders for Technical Industries

> 2007/2008

Alexandre Silva

Leaders for Technical Industries
UMinho
Country: **Portugal**
Background: **MSc. Biomedical Engineering, University of Minho, Portugal**
Starting Year: **2007/2008**
Supervisors: **Higino Correia (UMinho), Paulo Mendes (UMinho), Joel Clark (MIT)**

Research topic

The research addresses the full development of a novel integrated sensing solution based on optical fiber sensors embedded in PVC foils manufactured in industrial environment. It focuses the technological view of how to integrate and the management perspective of how to value it.

Carla Pepe

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc. in Engineering Design, BSc. Mechanical Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Elsa Henriques (IST-UTL), Daniel Whitney (MIT)**

Lean design in product development

The main goal of my research is to develop a systematic method to analyze the development of complex products in order to identify inefficiencies in the development process and find opportunities for possible improvements. Value Stream Mapping (VSM) and Design Structure Matrix (DSM) tools are used to visualize, discuss and assess the design process performance and guide the analysis towards the identification and elimination of major process bottlenecks. The proposed method composed by seven top-level steps was applied to the detailed design phase of a Rolls-Royce High Pressure Turbine Blade and it is being further developed to be applied to a system level on the preliminary and detailed design phases of a Rolls-Royce High Pressure Turbine Disc and its main interfaces.

Eduardo Santos

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc Engineering Design, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Paulo Ferrão (IST-UTL), Randy Kirchain (MIT)**

Eco-efficient Design and Advanced Manufacturing Practices, Systems Perspectives on Materials Technology Decision Making

Over the last two decades, a number of policies originating from the Extended Producer Responsibility principle have defined the way society manages waste generated from discarded products. The research intends to develop a framework to enhance the Eco-design of electrical and electronic products, based on producer responsibility systems that manage waste electrical and electronic equipments.

Helena López

Leaders for Technical Industries
UMinho
Country: **Spain**
Background: **MSc. Electric Engineering, Rio de Janeiro Federal University, Brazil; Electronics Engineering, Rio de Janeiro State University, Brazil**
Starting Year: **2007/2008**
Supervisors: **Higino Correia (UMinho), José A. Afonso (UMinho), Ricardo Simões (IPC-UMinho, IPCA), Chris Magee (MIT)**

Wireless patient monitoring

Objectives: 1) Specify and prototype a vital signs monitoring system targeted to a hospital. 2) Understand the potential offered by low power radio technologies applied to patient health monitoring under several scenarios. 3) Examine usability, financial, and social issues related to the interaction of different actors (hospital managers, caregivers, patients, and their families) in the medical environment and the system.

Ivo Ferreira

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc. Aerospace Engineering, IST-UTL, Portugal and Supaero, Toulouse, France**
Starting Year: **2007/2008**
Supervisors: **Paulo Gil (IST-UTL), Olivier de Weck (MIT), Pedro Oliveira (UMinho)**

Research topic

The research focuses on the thematic of complex system design, more specifically on the conceptual design phase. Through the establishment of a complex system algebra, study of dynamic system representations, and multidisciplinary optimization methods, a concurrent engineering design tool is being developed. The goal of the tool is to facilitate the interaction of the different subsystems, and enable better design documentation, while providing a global perspective of the system (based on a real time "Design Structure Matrix"-like view of the system). Foreseen applications range widely from Automotive to Aerospace systems design, with many subsystems, medium/high technical complexity, and with several actors involved.

Marco Leite

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc., IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Arlindo Silva (IST-UTL), Elsa Henriques (IST-UTL), Randolf Kirchain (MIT), Rich Roth (MIT)**

Research topic

All products are made of some material. A new methodology for materials selection issues in complex systems is proposed. The proposed methods will allow discussion on the implications of variety versus commonality in large complex systems.

Pedro Marques

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc. Engineering Physics, University of Lisbon, Portugal; BSc. Industrial Engineering, FCTUNL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Arlindo Silva (IST-UTL), Elsa Henriques (IST-UTL), Chris Magee (MIT)**

Establishment of a model for rational thinking that fosters creativity in product development regarding innovation outputs in complex systems

Rui Carreira

Leaders for Technical Industries
FEUP
Country: **Portugal**
Background: **MSc. Industrial Engineering and Management, FEUP, Portugal**
Starting Year: **2007/2008**
Supervisors: **Lia Patrício (FEUP), Renato Natal (FEUP), Chris Magee (MIT)**

Research topic

The objectives of this research project are twofold: First it aims at improving the methods for eliciting and incorporating customer experience requirements (CERs) into product design, with an application to bus interior design. Second, it aims at improving the integration of product and service components into the design of the overall offering.

2007/2008

> 2008/2009

Sérgio Tavares

Leaders for Technical Industries
FEUP
Country: **Portugal**
Background: **MSc Mechanical Engineering, FEUP, Portugal**
Starting Year: **2007/2008**
Supervisors: **Paulo M.S.T. de Castro (FEUP), Pedro Vilaça (IST), Thomas Eagar (MIT), Jorge dos Santos (GKSS)**

New Design Concepts for Aeronautical Products Welded by Friction Stir

The implementation of emerging processes in safety critical and complex applications requires the complete understanding of the consequences of the replacement of technologies. In this case, friction stir welding, a promising joining process for aluminum structures, is used as a case study of the process development of new design concepts for large structures, taking into account the different aspects and implications related to technological evaluation, manufacturing, and life cycle of the component.

Alexandra Sepúlveda

Leaders for Technical Industries
UMinho
Country: **Portugal**
Background: **MSc. Polymer Engineering, University of Minho, Portugal**
Starting Year: **2008/2009**
Supervisors: **António Pontes (UMinho), Júlio Viana (UMinho), Brian Wardle (MIT)**

Technologies for flexible sensors in the design of a smart stent-graft

The project aims the development of a stent-graft with built-in monitoring capabilities (smart stent-graft). Therefore, and due to the minimal invasive procedure used for the endoprosthesis deployment, the sensor to be used must be foldable, very flexible and have a small profile. These constraints affect severely the use of silicon based microtechnologies as sensing elements. It is expected that the use of sensing elements on the stent-graft can help achieve a better diagnostic/monitoring of the implantable device. The final product will integrate individual parts/functions (stent-graft, capacitive sensor, inductor and external telemetric system).

Bruno Soares

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc. Mechanical Engineering, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **Luís Reis (IST-UTL), Luís Sousa (IST-UTL), David Wallace (MIT)**

Cork applications and capabilities

In order for natural products, such as cork, to rise in usage and popularity among designers and engineers, there needs to be more than the idea that such materials are greener. Its mechanical properties for any given application must be known, and those figures must be coupled to factors such as environmental performance and cost issues. The thesis is to address is addressing these problems using cork composites as the natural material, and nautical applications as its case study. In the thesis it will be performed mechanical tests relevant to the application as well as perform a Life Cycle Analysis (LCA) study of said composites. These analyses will enable the calculations of a multitude of indexes, in order to easily compare said composites with any material an engineer sees fit to replace. These indexes (e.g. ρ/cost, CO2/G, α/ρ), will serve as a simple, quick way for engineers to check if a material in any given application can be swapped for cork composites, and what are the drawbacks of this swapping.

Cláudia Duarte

Leaders for Technical Industries
UMinho
Country: **Portugal**
Background: **MSc. Engineering and industrial management, University of Minho, Portugal**
Starting Year: **2008/2009**
Supervisors: **Valério de Carvalho (UMinho), Ana Paula Povoa (IST-UTL), Stanley B. Gershwin (MIT)**

Research topic

The case study of the AutoEuropa production system will be taken as the basis for the development of the current PhD project (Single line for assembly just-in-sequence multiple models). An analysis of the system is going to be performed considering the improvement of the production mix sequences for the single line to improve the production capacity and flexibility so as to answer to aggressive fluctuations in volume demand.

Inês Ribeiro

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc. Mechanical Engineering, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **Paulo Peças (IST-UTL), Richard Roth (MIT), António Pontes (UMinho), Elsa Henriques (IST-UTL)**

Research topic

My reserach aims to drive mould design to be performed in a life cycle perspective in order to assure the matching between the mould attributes and the user's needs in the mould utility standpoint. Moreover, it intends to integrate a comprehensive life cycle analysis with utility functions in order to estimate in an assertive way the impacts in terms of costs and environmental impacts for different scenarios. By this, the cost paradigm is shifted to the sustainable design paradigm, in which not only cost impacts influence the mould project, but also the environmental impacts and other aspects involving the mould performance throughout its life cycle.

Isa Cristina Santos

Leaders for Technical Industries
FEUP
Country: **Portugal**
Background: **MSc. Mechanical Engineering and Industrial Design, FEUP, Portugal**
Starting Year: **2008/2009**
Supervisors: **João Manuel R. S. Tavares (FEUP), Luís Alexandre Rocha (UMinho), Jeremy Gregory (MIT)**

Research topic

The project aims to study product development methodologies and to propose a process of concept selection based on the medical device's expected clinical and economical effectiveness. It will also study the diffusion and adoption of innovation in health care and include those concepts during the early stages of product development. The processes developed will then be applied in the development of a smart stent-graft.

João Ferreira

Leaders for Technical Industries
UMinho
Country: Portugal
Background: **PhD, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisor: **João Luiz Afonso (UMinho)**

Research topic

In this work I propose the design of a system to create and handle an Electric Vehicle (EV) community, based on social networks collaborative approach. This system is part of a V2G (Vehicle-to-Grid) module that allows EV owners to be aggregated in communities and participate in the electricity market. With this system it is possible for the EV owners to win money while the EVs are parked and plugged, delivering back to the electrical grid part of the energy stored in the batteries, increasing the attractiveness of EVs.

João Pedro

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc. Industrial Engineering and Management, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **Luís Sousa (IST-UTL), Luís Reis (IST-UTL), William Mitchell (MIT)**

Research topic

The thesis aims at developing an economically viable multi-functional wheel module, to be deployed on vehicles requiring an electric powertrain, on an attempt to reduce their costs. The module will be conceptualized and developed on both engineering and economic grounds, attempting to include the following functions: vehicle contact with the road (tire), electric propulsion, mechanical braking, regenerative braking, steering and suspension.

José Gaspar

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **Msc Engineering Design, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **Mihail Fontul (IST-UTL), Elsa Henriques (IST-UTL), Qi Holmes (MIT)**

Decision Making Methodology on HMI Innovative Processes

Objectives: 1) continuous research on in-car HMI research, 2) creation of a model that relates the user satisfaction with product attributes and engineering parameters, 2) identification of engineering parameters with larger impact on user satisfaction, 3) identification and study of engineering solutions aiming to increase the user satisfaction, 4) integration of the results in a cost / user satisfaction approach.

Lia Oliveira

Leaders for Technical Industries
FEUP
Country: **Portugal**
Background: **MSc. University of Minho, Portugal**
Starting Year: **2008/2009**
Supervisors: **Jorge Pinho de Sousa (FEUP), João Claro (FEUP), Richard de Neufville (MIT), Ana Póvoa (IST-UTL)**

Increasing flexibility and collaboration in the automotive supply chain network

The main goal of this research project is to design a methodology and a set of tools for supply chain management, to help cope with more and more demanding market requirements. Higher levels of flexibility and collaboration in complex supply chain networks will allow the increase of competitiveness, particularly in the case of small and medium sized enterprises (SME). Due to their structure and weaknesses, SME have a considerable difficulty in surviving and in being successful. Therefore this study aims at creating a methodology for supporting supply networks coordination activities, a collaborative platform to guarantee higher levels of visibility and information sharing among the supply network partners, and a set of tools that can help these companies to succeed.

Malliaros Ioannis

Leaders for Technical Industries
IST-UTL
Country: **Greece**
Background: **MSc. Product and Systems Design Engineering, University of the Aegean, Greece.**
Starting Year: **2008/2009**
Supervisors: **Mihail Fontul (IST-UTL), Elsa Henriques (IST-UTL), Qi Hommes (MIT), Lia Patricio (FEUP), Paraskevas Papanikos (U Aegean)**

HMI on Sensitivity Functions approach: case of non-visual senses

One of the development areas of In-Car Interfaces (ICI) deals with the need of using alternative communication channels that goes beyond the visual senses. The functionality of an interface is not limited to its utility, but has a broader scope that includes the addressing of a desired feeling, defined as a goal by the automotive company. In fact, automotive companies look forward to something more than the fulfilling of requirements. They expect a certain "feeling" to be achieved when the final customer interacts with the device. The aim of this research is to establish a methodology which will contribute to attain the expected feeling, evoked by non-visual senses.

Maria Fernández

Leaders for Technical Industries
FEUP
Country: **Portugal**
Background: **MSc. Metallurgical and Materials Engineering, FEUP, Portugal**
Starting Year: **2008/2009**
Supervisors: **Marcelo Moura (FEUP), Lucas Silva (FEUP), Antonio Torres Marques (FEUP), Manuel Freitas (IST), Thomas Eagar (MIT)**

Repair of Aeronautical Structures Under Fatigue Loading

Miguel Queirós

Leaders for Technical Industries
UMinho
Country: Portugal
Background: **MSc Mould Design and Manufacture, BSc. Mechanical Engineering, University of Minho**
Starting Year: **2008/2009**
Supervisors: **António Pontes (UMinho), Rich Roth (MIT)**

Research topic

More functionalities in a very small volume and new properties emerging from the micro scale (from mm to µm) have increased the interest on micromanufacturing technologies in electro-mechanical systems, optical and medical devices. Micromoulding has the potential to produce large number of complex 3D components in the micro scale, at low cost. However deeper understanding of process selection, process control and tool manufacturing is needed, in order to enable accurate cost modeling of the process. Conventional cost modeling is mainly based on the mass of final parts. Since mass related cost has very small impact on the final production costs of microparts, conventional cost models are inadequate for the production of microscale parts.

Nino Pereira

Leaders for Technical Industries
UMinho
Country: Portugal
Background: **MSc. Electronics Engineering, University of Minho, Portugal**
Starting Year: **2008/2009**
Supervisors: **Fernando Ribeiro (UMinho), Jorge Lino Alves (FEUP), Daniel Whitney (MIT)**

Golf Ball Picker Robot: path generation in unstructured environments towards multiple targets

Existing path planning algorithms for autonomous robot navigation have proven to be valid under specific circumstances and known environments. There isn't a global algorithm that suits all applications and environments. Specifically, for unstructured environments, there is additional complexity due to the uncertainties of the modeled world. Moreover, most of studies have focused a single target path planning. This project addresses multi target path planning on external and unstructured environments. The work is subdivided in different tasks to accomplish major milestones, beginning with an algorithm for multiple targets and then progressively adding constraints such as robot geometry, obstacle avoidance, maximum number of targets, and lack of total information about targets location. The main objective is to maximize the robot task efficiency.

Nuno Loureiro

Leaders for Technical Industries
FEUP
Country: **Portugal**
Background: **MSc. Mechanical Engineering, MSC. in Industrial Design, FEUP, Portugal**
Starting Year: **2008/2009**
Supervisors: **José Luis Soares Esteves (FEUP), Júlio Viana (UMinho), António Torres Marques (FEUP), Satyabrata Ghosh (UMinho), Frank Field III (MIT)**

Research topic

The work aims at developing new material solutions for eco-sustainable automotive components, enabling the use of emerging green composites, based on biodegradable polymer matrices and natural reinforcements in automotive components of an urban vehicle. As a relevant case study, a door trim module will be considered with the main components being: a door liner, a door trim and a door foil. The new material solutions will meet current standards for automotive door trims. These solutions will be based in biodegradable polymers and natural reinforcements.

Raquel Folgado

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc. Mechanical Engineering, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **Elsa Henriques (IST-UTL), Paulo Peças (IST-UTL), Stan Gershwin (MIT), Guilherme Silva (UMinho)**

Influence of Variability on Assembly Systems

Increasing variability always degrades the performance of a production system and therefore reducing it is always desirable, but it can't be totally eliminated through managerial action. Different levels of variability and its location on the assembly system must be tested in order to understand its impact on the system. From that analysis it will be possible to build guidelines that aid on reducing the influence of sources of variability in systems that are already producing parts – through new operating policies or redesigns of lines, but also guidelines for the early stages of design of a production system.

Ricardo Almeida

Leaders for Technical Industries
FEUP
Country: **Portugal**
Background: **MSc., University of Aveiro, Portugal**
Starting Year: **2008/2009**
Supervisors: **Américo Azevedo (FEUP), José Crespo Carvalho (ISCTE), David Simchi-Levi (MIT)**

Flexible information technologies for complex supply chain networks

This research work will be developed in the scope of a broader research project (FLEXINET) about flexibility and agility in the automotive supply networks. It intends to study how to handle inherent complexity of supply chain networks, allowing companies to manage their visibility, achieving a high level of capacity planning flexibility and management agility; to deal with uncertainty demand and capacity restrictions, all over the extended supply chain network. As final result, it is expected to design an innovative information technology infrastructure (service-oriented) to support such an interactive system for supply chain networks, and the needed data model able to increase complexity on network messages, to promote a complete collaborative approach.

Ricardo Torcato

Leaders for Technical Industries
FEUP
Country: **Portugal**
Background: **BSc. Industrial Engineering**
Starting Year: **2008/2009**
Supervisors: **Ricardo Santos (FEUP), Madalena Dias (FEUP), Richard Roth (MIT)**

Research topic

The main aim of this research is to identify and organize the knowledge required in the development process of RIM (Reaction Injection Molding) parts at the early product development stage, specifically the material selection, mold design and the process planning for mold making and molding operation. This work will assess if an Expert System, a computer program that uses knowledge and inference procedures to model the RIM development process, provides the necessary insight into metrics such as development lead time and manufacturing costs to deal with the decision making required in that stage.

> 2009/2010

Ana Silva

Leaders for Technical Industries
UMinho
Country: Portugal
Background: **MSc. Biomedical Engineering, University of Minho, Portugal**
Starting Year: **2009/2010**
Supervisor: **Paulo Costa (FEUP)**

Research topic

Artificial vision based automatic classification and quality control for car tires. Stereoscopic vision, structured lightning and triangulation techniques are to be tested on producing a 3D reconstruction able to spot tire imperfections and uniquely identify its model.

Anton Sabaleuski

Leaders for Technical Industries
FEUP
Country: **Republic of Belarus**
Background: **MSc. in Mechanical Engineering in Transports, Belarusian National Technical University, Belarus**
Starting Year: **2009/2010**
Supervisor: **Francisco Pires (FEUP)**

New materials and solutions for next generation seats: from TGV to regional trains

This project aims to bring Engineering Systems approach to a standard development process of seats for transportation industry, with a particular focus on seats for fast trains. The potential technological opportunities, as high-performance materials and new designs, will be explored taking into account social and economical aspects with regards to the entire product life.

Cláudio Santos

Leaders for Technical Industries
UMinho
Country: Brazil
Background: **MSc. Industrial Engineering, University of Minho, Portugal**
Starting Year: **2009/2010**
Supervisors: **Madalena Araújo (UMinho), Nuno Correia (FEUP), Jeremy Gregory (MIT), Randolph Kirchain (MIT)**

Sheet metal machine design and markets under uncertain future environments: cost based tools

The aim of this work is to understand what systems, technologies, materials, etc should make part of company technology strategy in the near future to offer a differentiated product. Parameterized cost based tools to support the machine design process, based on advanced cost models, are to be developed and integrated in the engineering systems approach to the problem.

Filipe Nascimento

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc. Materials Engineering, IST-UTL, Portugal**
Starting Year: **2009/2010**
Supervisor: **Francisco Pires (FEUP)**

Smart Seat design

The aim of this project is to develop a chair using novel materials and techniques in order to build a light chair as improved characteristics regarding the normal seats and that guarantees the safety of the driver and passengers.
The development of this will consider the normal passive safety systems that are in a seat but it will also have an active safety system that will react to the stimuli that is produced during a car impact and will react in order to protect the driver and passenger as much as possible.

Georgios Koronis

Leaders for Technical Industries
IST-UTL
Country: **Greece**
Background: **MSc. Product and systems design engineering, University of Aegean, Greece**
Starting Year: **2009/2010**
Supervisors: **Not yet defined**

Research interests

Renewable materials in electric vehicles and building constructions (ReMEV): supply chain and manufacturing process issues and their relations in an established materials triangle regarding: auto enclosures standards / the perception of users and companies / and architecture research for electric vehicles (EVs).

Irene Carvalho

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc. Materials Engineering, IST-UTL, Portugal**
Starting Year: **2009/2010**
Supervisors: **Arlindo Silva (IST-UTL), Paulo Peças (IST-UTL)**

Research interest

Product design flexibility, life-cycle uncertainties, sociotechnological systems sustainability, renewable materials as engineering materials.

Maria Azevedo

Leaders for Technical Industries
UMinho
Country: Portugal
Background: **MSc. Production Engineering, University of Minho, Portugal**
Starting Year: **2009/2010**
Supervisor: **Jorge Pinho de Sousa (FEUP)**

NETwave – Managing dynamic supply networks through SME collaboration

My research is focused on supply chain networks and logistics problems.

Michael Donauer

Leaders for Technical industries
IST-UTL/FEUP
Country: **Germany**
Background: **BSc. Wirtschaftsingenieur, Universität Karlsruhe (TH), Karlsruhe Institute of Technology (KIT), Germany**
Starting Year: **2009/2010**
Supervisors: **Américo Azevedo (FEUP), Paulo Peças (IST)**

Research topic

So far 100% of the production of car tires is controlled visually and manually by 20 inspection places which exist at the end of the manufacturing line. The objective of this project is the reformulation of the final inspection process. This consists of an automated detection of defects which is a complex problem due to multiple defect types in a heterogeneous composite material. Furthermore the inspection steps in the manufacturing process should be optimized. Last an implementation plan proposal with a deadline and cost estimation for realization and the identification of supplier/ installer should be delivered.

Nelson Oliveira

Leaders for Technical Industries
UMinho
Country: Portugal
Background: **MSc. Polymer Engineering, University of Minho, Portugal**
Starting Year: **2009/2010**
Supervisors: **António José Vilela Pontes (UMinho), José Leite Pinto (Olesa)**

Research topic

Advanced mould assembling technologies for high precision polymer based optical components, with the objectives of mapping of the technological development needs and scientific base support in the in-mould assembling technologies; studying the feasibility of the use of a laser head operating inside a mould; developing an adequate cost model for in-mould assembling technology; developing of a prototype mould including in-mould laser operating head and in-mould welding using the injection of a welding ring sealing, and tested with optical components for lightening automotive systems.

Nuno Oliveira

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc. Biomedical Engineering, IST-UTL, Portugal**
Starting Year: **2009/2010**
Supervisors: **Not yet defined**

Research interests

The main objective of this project is to develop chitosan advanced products with strait control of shape/geometries and mechanical properties for medical applications for different purposes, deriving from nowadays emerging needs.

Ricardo Sá

Leaders for Technical Industries
UMinho
Country: Portugal
Background: **MSc. in Biomedical Engineering – Field of Biomaterials, Rehabilitation and Biomechanics, University of Minho, Portugal**
Starting Year: **2009/2010**
Supervisor: **Ferrie van Hattum (UMinho)**

New structural materials and design for industrial laser cutting machines

Traditional machine structures are steel based. This project intends to explore the use of new composite solutions in the structural framework of industrial laser cutting machines considering different designs, static and dynamic structural analysis, manufacturing implications, as well as economical and business considerations.

Rui Rocha

Leaders for Technical Industries
UMinho
Country: Portugal
Background: **MSc. Industrial Electronics and Computer Engineering, University of Minho, Portugal**
Starting Year: **2009/2010**
Supervisors: **José Higino Correia (UMinho)**

Integrated systems for smart interiors

Samuel Moniz

EDAM LTI
FEUP
Country: **Portugal**
Background: **BSc. In Electrical and Computer, FEUP**
Starting Year: **2009/2010**
Supervisor: **Ana Póvoa (IST-UTL)**

OPPS Optimal Production Planning and Scheduling of a Multipurpose Batch Plants

The project will focus on the planning and scheduling of multipurpose batch plant aiming at building a tool that will help the decision making process associated with such activities. Generic optimization models will be developed that will be then used to solve the production planning process at HOVIONE.

Sara Marques

Leaders for Technical Industries
IST-UTL
Country: **Portugal**
Background: **MSc. Mechatronic Engineering, Instituto Superior de Transportes e Comunicações, Portugal**
Starting Year: **2009/2010**
Supervisors: **Carla Silva (IST-UTL), Luís Reis (IST-UTL)**

Research topic

The aim of the research is to develop an eco-scoring of the energy and CO_2 emissions of light duty vehicles considering several technologies; internal combustion engine vehicles, hybrid vehicles (with internal combustion engine or fuel cell), pure electric vehicles, plug-in hybrid vehicles and different end users (city, highway, mix driving and driving frequency).

Senay Sadic

Leaders for Technical Industries
IST-UTL
Country: **Turkey**
Background: **MSc. Management Engineering, Degree Industrial Engineering, Istanbul Technical University, Turkey**
Starting Year: **2009/2010**
Supervisor: **Jorge Manuel Pinho de Sousa (FEUP)**

Research interests

Supply Chain Management, Operations Research, Decision making, Customer Relationship Management, Strategic Decision making in Marketing.

Vasco Teles

Leaders for Technical Industries
FEUP
Country: **Portugal**
Background: **MSc. Electrical and Computer Engineering, FEUP, Portugal**
Starting Year: **2009/2010**
Supervisors: **José Manuel Mendonça (INESC Porto), António Paulo Moreira (FEUP)**

Research topic

To detail the importance of technology innovation in business and define a concrete framework to support companies' technological innovation, while researching in an industry driven project that aims to implement a new robotic pilot solution to automate the inspection of tires in Continental Mabor.

MIT Portugal

Sustainable Energy Systems

> 2007/2008

Alexandra Marques

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Applied Plant Biology, FCUL, Portugal; MSc. International Management, ISCTE, Portugal**
Starting Year: **2007/2008**
Supervisors: **Tiago Domingos (IST-UTL), John Fernandez (MIT)**

Research topic

The first part of my research quantifies carbon emissions embodied in a country's final demand and in the payments made to primary factors of production. For this I use multi-region input-output (MRIO) models. My objective with this quantification is to provide understanding about the driving forces of indirect carbon emissions, and give ground to the development of a more effective approach to climate policy, through a carbon responsibility indicator and integration of indirect emissions in emissions prediction models. These will be the issues addressed in the second part of the research.

Ana Amorim

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Economics, University of Coimbra, Portugal**
Starting Year: **2007/2008**
Supervisors: **Manuel Victor Martins (ISEG-UTL), Patrícia Pereira da Silva (FEUC), Stephen Connors (MIT)**

Promoting renewable electricity (RES-E) while stepping into a single liberalized market. Evaluation of the Portuguese feed-in tariffs design options

The objectives are to assess the impacts of the public renewable electricity promotion strategy in Portugal and evaluate alternative design options to the incentive system in place.

Ana Gonçalves

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Physics Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Tiago Domingos (IST-UTL), John Fernandez (MIT)**

Research topic

My research work is focused on urban growth dynamics and its impact on a region's economic development and energy consumption. One of the main assumptions of this work is that urbanization and the growth of cities have a strong impact on a country's development and I will analyze in which ways that impact occurs.

Ana Neves

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **MSc. in Land Use and Environmental Planning, BSc. Environmental Engineering FCTUNL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Vítor Leal, Eduardo de Oliveira Fernandes (FEUP), Stephen Connors (MIT)**

Sustainable energy planning at the local level

Research and development of a comprehensive methodology for the elaboration of sustainable energy action plans, focused in the use of multi-criteria evaluation for the choice of actions. Development and application of indicators to assess the energy sustainability of municipalities

André Augusto

Sustainable Energy Systems PhD
FCUL
Country: **Portugal**
Background: **MSc. Physics and Technology Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisor: **João Serra (FCUL)**

Study of a process to grow silicon ribbons for solar cells applications

Crystalline silicon solar cells represent more than 90% of the world photovoltaics market. The silicon wafer itself accounts for about half of the photovoltaic module cost. Two aspects are essential to considerably reduce "wafer" costs: the feedstock issue and ribbon technology. The development of low cost photovoltaic technologies can dramatically boost the penetration of photovoltaics in the energy generation mix. The Silicon over Dust Substrate (SDS) is a process to grow silicon ribbons on top of a silicon powder (sacrificial layer) using a gaseous feedstock (silane). The SDS process has been successfully demonstrated and an international patent registration is under way. The present work is related to the Continuous Optical Fast Chemical Vapor Deposition (COFCVD) system development to obtain high quality silicon ribbons for solar cells applications directly from a gaseous feedstock.

André Pina

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Technological Physics Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Paulo Ferrão (IST-UTL), Carlos Silva (IST-UTL), Stephen Connors (MIT)**

Research topic

With energy being one of the main economic vectors, recent years have brought into focus several new options for increasing energy efficiency, reducing fossil fuel dependency and increase security of supply. This work aims to develop a new long-term techno-economic modeling methodology for energy systems that includes the hourly dynamics of electricity supply and demand. It will allow the study of the impact of introduction of electric vehicles, demand response, large penetration of renewables and energy storage systems, as well as how they work in combination with each other, to help determine which solutions are the most cost-effective.

Antero Silva

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **BSc. Electrical and Computers Engineering, FEUP, Portugal; Post-Grad in Sustainable Energy Systems, MIT Portugal Program at FEUP, Portugal**
Starting Year: **2007/2008**
Supervisor: **João Peças Lopes (FEUP)**

Strategies for Energy Storage and Sustainable Mobility in Isolated Power Systems: Development of a Multiobjective Decision Support Model to assess a set of alternatives, concerning energy storage and electric mobility rollout

Each alternative will gather meaningful attributes, such as: CO_2 emissions; overall costs (CAPEX and OPEX); and power system reliability. This decision-making model will be driven by the stakeholders' perception on the defined attributes. The referred mathematical model will be carried out for the São Miguel Island (Azores, Portugal), as a result the of its power system characteristics.

Cristina Camus

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. in Business Administration, Faculty of Economics, UNL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Tiago Farias (IST-UTL), Jorge Esteves (ISEL), Stephen Connors (MIT)**

Economic, Energy and Environmental Impacts of Plug-in vehicles in the Electric Utility System

This research is concerned with studying the potential impacts of the electric vehicles on the Portuguese electricity system, with a focus on the additional power demand, power generation emissions associated with EVs and the role of demand side management strategies in supporting their penetration as well as the economic impacts of EVs on electric utilities.

Filipa Carlos

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **BSc. Environmental Engineering, FCT-UNL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Eduardo Oliveira Fernandes (FEUP), Prof. Maria do Rosário Partidário (IST-UTL), Stephen Connors (MIT)**

Methodology for ranking natural energy resources based on environmental criteria

The major breakthrough of the thesis is the effort towards a more coherent treatment of energy, in particular renewable forms as part of the environment, the global and the local, which also assures the respect for local values. In such a context, it becomes justified and necessary to try to take into consideration the matching of available energy resources with specific energy demand in terms of energy quantity and quality, i.e., the characterization of the amount of heating, cooling or electricity specific energy services. The research tries to develop a methodology that can be applied sufficiently far upstream in the decision process of energy systems planning, allowing for a paradigm shift towards sustainability. It is necessary to make sure that each endogenous natural energy resource can be explored without compromising the local/regional environment. The strategic environmental assessment is used as a support tool.

Filipe Rodrigues

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Mechanical Engineering, ISEL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Carlos Cardeira (IST-UTL), João Calado (IST/ISEL), Leon Gliscman (MIT)**

Smart home energy storage for intelligent management of renewable energy consumption

This research project will provide a smart driver for: Energy demand; Feedback on energy consumption; Load management and Smart Energy Storage. The results of the research will allow development of a solution for energy storage to make the load balance of electric energy anticipate and defer the energy consumption.

Filipe Soares

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **BSc. Physics, Electrical Engineering (Renewable Energies) Post-Graduation, University of Porto**
Starting Year: **2007/2008**
Supervisor: **João Peças Lopes (FEUP)**

Research topic

This work main goal is to provide a valuable study about Electric Vehicles (EVs) and Vehicle-to-Grid (V2G), which intends to alert all potentially interested parties to the various problems that will appear when EVs start to be massively connected to the grid. Beyond the problems, it tries to prove the feasibility of V2G concept and intends to develop adequate grid operation strategies to overcome all technical issues identified. Envisioning future electric power system's structure, these new strategies will be created embedding V2G's capabilities in smart grid and multi-microgrids concepts. Furthermore, this project will seek to determine the economic and environmental impacts from using EVs combined with large amounts of renewable sources widely spread. An economic analysis will also be performed in order to define the incentives policies that should be adopted in order to motivate EVs' owners to provide services to the electric system.

Gonçalo Cardoso

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Civil Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Paulo Ferrão (IST-UTL), Ana Póvoa (IST-UTL), Chris Marnay (LBNL)**

Decentralized energy production towards a sustainable built environment

Integration of micro-generation technologies at the building level by using optimization algorithms to design the system capacity and operating schedule. Focus on energy management, technology integration and energy policy.

Gustavo Souza

Sustainable Energy Systems PhD
FEUP
Country: **Brazil**
Background: **BSc. Electrical Engineering, State University of Rio de Janeiro, Brasil**
Starting Year: **2007/2008**
Supervisors: **Vítor Leal (FEUP), Eduardo de Oliveira Fernandes (FEUP), Stephen Connors (MIT)**

Development of a methodology to assist the construction of energy efficiency action plans

The project began with the development of a methodology to disaggregate energy systems at the national or regional scope (i.e. systems that show the most representative energy end-uses, as well quantifying those energy uses and the factors that are responsible for those uses). From here efficiency measures with a physical basis can be quantified. This will help to find the most efficient ones to guide the construction of an Energy Efficiency Action Plan in a multi-criteria environment.

Joana Abreu

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. in Environmental Engineering, FCT-UNL, Portugal; MSc., Geographical Information Systems, Leeds University, United Kingdom**
Starting Year: **2007/2008**
Supervisors: **Jorge Vasconcelos (IST-UTL), David Marks (MIT)**

Uncovering the Potential for Demand Response in the Residential Sector

The main objective of my research is to gather information that will inform the development of responsive demand programs by experimentation and data mining. I developed a smart metering experiment in Portugal where a proprietary interface and Google Power Meter are used to inform participating individuals about energy usage. This is a type of smart metering deployment that uses a specific Home Area Network configuration to gather information about electricity consumption, while conveying information in real time to the occupants. As this is quite an unusual "utility" approach to smart metering, I am intrigued by the potential for demand response, on top of this design, specifically the behavioral and technological opportunities for load shaping, shifting and shedding.

João Lagarto

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Electrical Engineering, ISEL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Álvaro Martins (ISEG), Jorge de Sousa (ISEL)**

Market power evaluation and price forecasting in electricity markets

This research aims to develop a conjectural variations model that will be used to study the strategic behavior of the supply side agents in an electricity market and to forecast electricity market prices. The model will be applied to the Iberian electricity market (IBELM).

Jorge Borges

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Electrical Engineering, ISEL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Christos Ioakimidis (IST-UTL), Steven Connors (MIT)**

Electric Vehicles Infrastructure

Thesis objectives are to study and evaluate the economic and technical viability of an Electric vehicles infrastructure for fast charging processes, through the development of business models that better enable the massification of Electric vehicles and analyze the risk for stakeholders. It is also expected to analyze the geographical distributions for fast charging points in Portugal.

Julija Vasiljevska

Sustainable Energy Systems PhD
FEUP
Country: **Republic of Macedonia**
Background: **BSc. Power Systems, Faculty of Electrical Engineering of the Ss. Cyril and Methodius University, Skopje, Macedonia**
Starting Year: **2007/2008**
Supervisors: **João A. Peças Lopes (FEUP), Manuel A. Matos (FEUP), James Kirtley (MIT)**

Research topic

Adoption of hierarchical control strategies at different distribution network levels under the Micro-Grid (MG) and Multi Micro-Grid (MMG) concepts may be seen as a potential way to facilitate large scale integration of micro-generation (µG) into the system together with active load management. The impact that such a system may have on the distribution network will potentially lead to different regulatory approaches by creating incentive mechanisms for the Distribution System Operators, µG owners and loads to accept the MG and MMG concepts and define adequate remuneration schemes. Multi Criteria Decision Aid may be used for capturing different Decision Makers' preference structures, within the process of adoption of the MG and MMG concepts, by analysing the extent of potential benefits and costs attributed to these concepts deployment.

Kiti Suomalainen

Sustainable Energy Systems PhD
IST-UTL
Country: **Finland**
Background: **MSc. Engineering Physics, Chalmers University of Technology, Sweden**
Starting Year: **2007/2008**
Supervisors: **Paulo Ferrão (IST-UTL), Carlos Silva (IST-UTL), Stephen Connors (MIT), Manuela Juliano (UAc)**

Research topic

Characterization of renewable resource variability, mainly wind, by studying diurnal, monthly and annual patterns with the objective of constructing scenarios with an hourly time-step that realistically reflect the various possible outcomes based on historical statistical analysis. The result is not a prediction of the wind speed at a given hour, but a simulation of a possible chain of events, with application in energy systems modeling with high penetrations of intermittent renewables.

Leonardo Rosado

Program: Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc in Engineering Design, IST-UTL**
Starting Year: **2007/2008**
Supervisors: **Paulo Ferrão (IST-UTL), John Fernandez (MIT)**

Research topic

Urban areas have become one of the main focal point to tackle sustainability. Different methods, studies and monitoring schemes have been established for these areas, but an integrated approach, covering cities from a systemic point of view rarely exist. In that sense, the Urban Metabolism approach, based on energy and material flows of the interrelations between the economy and the environment, establishes a framework to manage urban areas. Within the Urban Metabolism framework special attention has to be made to the role of households and their critical contribution for the overall material flows within a city. Overall, There is an opportunity to construct a system dynamics model that can describe Urban Material flows and provide valuable information for municipal actors as well as waste recycling companies, namely changing consumption patterns and establishing minimum acceptable thresholds, as well as changing lifespan of selected products and stimulating reuse of products that are still functional and recycling of materials of non functional products.

Manuel Rocha

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **BSc. Electrical and Computer Engineering (FEUP), MSc. in Business Administration (IEP/ESADE Barcelona)**
Starting Year: **2007/2008**
Supervisors: **João Tomé Saraiva (FEUP), Stephen Connors (MIT)**

Transmission Expansion Planning, a Multiyear Approach Considering Uncertainties

The research aims at developing a new dynamic model to perform evaluation of investment plans on realistic transmission systems, in an accurate and reliable way, and taking into consideration the uncertainties and vagueness that characterize the new energy paradigm. Reliability analysis will be considered as an indicator to measure the quality of the service inherent to the investment plan.

Maria Kapsalaki

Sustainable Energy Systems PhD
FEUP
Country: **Greece**
Background: **BSc. in Physics, MSc. in Environmental Physics, National and Kapodistrian University of Athens (NKUA)**
Starting Year: **2007/2008**
Supervisors: **Vitor Leal (FEUP), Mat Santamouris (NKUA), Leon Glicksman (MIT)**

Identification of the best strategies for the design of Carbon Neutral Buildings in respect to climate diversity

This will be achieved though the development of a calculation tool that based on a given geometry type and geographical location, determines the energy needs, flows and a life cycle economic analysis for many envelopes, energy services and local offset equipment alternatives.

Marta Mota

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **MSc Economics, Faculty of Economics, University of Porto, Portugal**
Starting Year: **2007/2008**
Supervisors: **Eduardo Oliveira Fernandes (FEUP), Sara Slaughter (MIT)**

Corporate Reporting Towards Sustainability – Towards an assessment method for comprehensive and universal sustainability reporting

The purpose of this research is to assess the quality level of sustainability reporting and to understand the actual and potential contributions for the promotion of sustainable development at corporate level. Some potential issues that the market is not yet valuing properly are also considered as part of the development of a new methodological proposal for reporting on sustainability.

Miguel Covas

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **Post-Graduation in Telecommunications Management, ISEG-UTL**
BSc. Electrical Engineering, IST-UTL, Portugal
Starting Year: **2007/2008**
Supervisors: **Carlos Silva (IST-UTL), Luis Dias (FEUC)**

Sustainable Data Centers

Develop a strategy and methodology that enables the design of a Sustainable Data Center. A tool should be developed to analyze and support the decision making for a sustainable DC (e.g. Multi Criteria Decision Making).

Nuno Pereira

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Environmental Engineering, IST, Portugal**
Starting Year: **2007/2008**
Supervisors: **Luísa Caldas (IST-UTL), Manuel Correira Guedes (IST-UTL), Leon Glicksman (MIT)**

Energy-Efficient Retrofit of Buildings in Lisbon (study about 1960's-1970's typologies)

Define the best available retrofit options for 1960's-70's residential building typologies in Lisbon. Energy modeling with EnergyPlus will be performed and tested against field monitoring of 6 existing buildings. Different energy-retrofitting measures are simulated using the models, and prioritized in terms of return-on-investment periods. The final objective is to assess the potential for energy reductions at the urban level, by a chosen optimal package, and to develop a methodology to implement the outputs of the research in large-scale rehabilitation schemes, following an integrated and comprehensive analysis.

Patrícia Baptista

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. in Chemistry, IST-UTL**
Starting Year: **2007/2008**
Supervisors: **Tiago Farias (IST-UTL), Carla Silva (IST-UTL), John Heywood (MIT)**

Evaluation of the impact of new vehicle and fuel technologies in the road transportation sector

The project seeks to assess the scale and timing of impact of alternative vehicle and fuel technologies and of mobility, policy and social driven options in the Portuguese road transportation sector, mainly in terms of energy consumption and GHG emissions.

Pedro Almeida

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **MSc. Electrical Engineering, FEUP, Portugal**
Starting Year: **2007/2008**
Supervisors: **João Peças Lopes (FEUP), James Kirtley (MIT)**

Research topic

The purpose of this thesis is to identify grid operational management and control strategies that should be available with the presence of vehicles with plug-in capabilities, exploiting and expanding smart charging and smart metering strategies. There is a high potential for V2G to participate in several power systems services. Whether providing extra installed capacity for peak load demand or participating in the spinning reserves or in regulation of the system, V2G is new to the current structure of the grid. This thesis focuses on the effects and benefits of EVs and V2G connections on the power systems dynamic behavior for both islanded and interconnected grids. Major synergies between the utilities and the EV owners are envisioned through means of cost reduction for both parties. By adopting adequate strategies social welfare will be increased and the environment and quality of life will benefit as well.

Pedro Fonte

Sustainable Energy Systems PhD
FCUL / FEUP
Country: **Portugal**
Background: **MSc, Electrical and Computer Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Pedro Miranda (FCUL), Claudio Monteiro (FEUP)**

Research topic

Operation of power systems with high penetration of renewable sources as solar, wind and mini-hydro is a challenging task due to the stochastic nature of the production. This requires some prediction tools to prepare the bids for the markets. The aim of this thesis will be to study the reduction of production variability resulting from the aggregation of three intermittent non dispatchable renewable (mini-hydro, wind and solar).
After the study of variability characteristics the solutions to reduce this variability will by found, at long-term planning (skills mix) and short-term (forecast aggregate variability and storage management for mitigation of variability). Several power forecast techniques were already developed for short and long-term but all of them have associated errors. These results will be used to study the impact of mix planning solutions of intermittent renewable energy at regional or national level.

Pedro Silva

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **MSc. Mechanical Engineering, FEUP, Portugal**
Starting Year: **2007/2008**
Supervisors: **Vítor Leal (FEUP), Marilyne Andersen (MIT)**

Selection of glazing and shading devices for office buildings: Criteria and integrated optimization

This work aims to develop a methodology for the selection of energy-efficient glazing and shading solutions for office buildings by studying the influence of different systems upon energy consumption for heating, cooling and lighting. The way of considering the dynamic interaction of the building occupants with the electric lighting and the shading devices due to comfort requirements of illumination and glare is a key element of this research.

Raquel Segurado

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Physics Engineering, IST, Portugal**
Starting Year: **2007/2008**
Supervisors: **Maria da Graça Carvalho (IST-UTL), Neven Duic (University of Zagreb), Luís Alves (IDMEC-IST), Stephen Connors (MIT)**

Research topic

The thesis aims to develop a methodology for the optimization of the penetration of renewable energies in isolated energy systems, with emphasis for islands and remote regions. The work will be based on the RenewIslands methodology and the H2RES model, adding the necessary modules, and an economic analysis of the modeled scenarios.

Ricardo Manso

Program: Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Physics Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Paulo Ferrão (IST), John Fernandez (MIT)**

Urban Metabolism – Simulation Tools

The research is intended to develop a model to characterize the metabolism of urban systems. This model is based in the assumption that the characterization of the physical nature of human economy is vital for understanding the sources and full nature of impacts of society upon the natural environment and also that effective strategies toward sustainable development will rely on the understanding of the interaction between economic activities and their physical dimension represented by material and energy flows. It characterizes the interplay between urban infrastructures, people and communities (and their needs), and business and service providers. It is intended to help decision-making to understand the flows of materials and energy demand through a set of models organized in different and complementary layers of information that can be used to develop high level urban systems optimization studies that will contribute to identify scenarios and subsequent policies that might arise through closing the gaps between current practice and truly material and energy-optimized cities.

Rui Gomes

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Mechanical Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Luís Gato (IST-UTL), António Falcão (IST-UTL), Chiang Mei (MIT)**

Research topic

My PhD research concerns the development of an offshore wave energy conversion system. This development is based on the application of numerical and experimental models to simulate and optimize the energy conversion chain of full-scale devices. Throughout this work, special emphasis is made on the investigation of adequate and practical control strategies to maximize energy extraction.

Sandrina Pereira

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Aerospace Engineering, IST-UTL, Portugal**
Starting Year: **2007/2008**
Supervisors: **Maria da Graça Carvalho (IST-UTL), Luís Alves (IDMEC-IST-UTL), Stephen Connors (MIT)**

Decision support system for low carbon regions

The PhD aims to develop a Decision Support System in order to help the Decision Makers in the development of a strategy to transform a region in a Low carbon Region – Decision Support System for Low Carbon Regions – DSS4LCR. The DSS4LCR will be comprised of two sub-models: a Scenario Generator and Assessment Model and a Decision Support Model based on indicators and multi-criteria analysis. The DSS4LCR Scenario Generator Model will be a combination of three interconnected models: a Social Organisation Model, a Technology Model and an Economic Model that will produce the necessary inputs to the Energy Consumption and Emissions Model, which will generate the low carbon scenarios. A set of indicators – economic, environmental, social, will be applied to these scenarios, and they will be assessed based in a multi-criteria analysis.

> 2008/2009

Amir Safaei

Sustainable Energy Systems PhD
FCT-UC
Country: **Iran**
Background: **BSc Industrial Engineering, Azad University, Iran; MBA, University of Glasgow, UK**
Starting Year: **2008/2009**
Supervisors: **Fausto Freire (UC), Carlos Henggeler Antunes (UC)**

Life cycle optimization model for integrated cogeneration and photovoltaic systems

The objective of this doctoral research is to develop a modeling framework to optimize a school building's operation by integrating congregation systems, solar technologies (PV) and utility systems in order to meet the electrical, heating, and cooling demand by considering the life cycle environmental impacts and economical implications. LCA Optimization models will be developed within a framework that uses the results of the building energy simulation and life cycle assessment (LCA). Building energy simulation will provide the energetic data of the building under investigation, while LCA results provides the coefficients of the optimization problem that is developed to consider both economic and environmental aspects.

André Ribeiro

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Electrical Engineering and Computer Science, University of Coimbra, Portugal**
Starting Year: **2008/2009**
Supervisors: **Samuel Niza (IST-UTL), John Fernandez (MIT)**

Research topic

My research area is Urban Metabolism. More specifically I focus on system dynamics models to characterize urban resiliency against socioeconomic events. The hypothesis is that existing urban stocks along with new industrial symbioses may be the key for a more resilient region. The temporal scope of the events under study is divided in three scales: (short-term) emergency response (e.g. human made or natural disasters); (mid-term) adaptation and symbiosis (changes in urban socioeconomic patterns); (long term) structural changes (to regional or urban form).

António Santos

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **MSc. Electrical Engineering, FEUP, Portugal**
Starting Year: **2008/2009**
Supervisors: **João Peças Lopes (FEUP), Manuel Matos (FEUP), James Kirtley (MIT)**

Research topic

Since wind power penetration in the electrical grids is becoming higher it is urgent to develop new tools in order to deal with the sudden loss of wind generation provoked by short circuits. These tools should lead with the different kind of wind generators (with and without fault ride through capability). The conventional security assessment performed by the System Operators adopts a contingency procedure which doesn't consider the sudden loss of wind generation provoked by short-circuits. The tool that is being developed in this thesis analysis the behavior of wind generators after those kind of disturbances and assesses its impacts on the electrical networks. The results provided from this evaluation will give indicators to system operators in order to implement some preventive control measures (wind generation curtailment, increase of reserve levels, scheduling, generation re-dispatch, etc) which will lead to a safe integration of this large scale of wind power generation.

Ariovaldo Carvalho

Sustainable Energy Systems PhD
FCT-UC
Country: Brazil
Background: **MSc. Economics, Faculty of Economics, University of Coimbra, Portugal**
Starting Year: **2008/2009**
Supervisors: **Fausto Freire (UC), Carlos Henggeler Antunes (UC)**

An integrated assessment methodology applied to the Brazilian bioethanol case

Bioethanol from sugarcane has emerged as the main alternative to fossil fuels in the Brazilian transportation sector. This impels the assessment of its economic, social and environmental performance, to be compared with the displaced fossil fuels. The Life Cycle Assessment (LCA) methodology has been applied to investigate the energy and carbon balances of sugarcane-based bioethanol and, in a smaller number of cases, also looking at wider environmental impacts. The standard ISO LCA does not address economical and social aspects, but LCA can be extended to include these aspects, combined with mathematical programming (optimization) techniques. In this context, the aim of this work is to develop an integrated multi-objective life cycle approach improving published LCA studies of Brazilian bioethanol. The purpose is to evaluate the energy and carbon balances over the supply chain of this product considering the differences and variations at the regional and technological levels in all processes involved, and to join this analysis with other economical, social and environmental issues. This PhD research also intends to develop and implement a systemic combination of multi-objective optimization and uncertainty/robustness analysis over the entire bioethanol supply chain. The objective is to assess the trade-offs among economic, social and environmental objectives in the overall bioethanol system in a prospective way capable of producing sound recommendations to planners while dealing with the sources of uncertainty associated with this system.

Daniel Wiesmann

Sustainable Energy Systems PhD
IST-UTL
Country: **Switzerland**
Background: **BSc. in Physics, Swiss Federal Institute of Technology (ETH Zurich), Switzerland**
Starting Year: **2008/2009**
Supervisors: **Paulo Ferrão (IST-UTL), John Fernandez (MIT), Inês Azevedo (CMU)**

Urban Resource Consumption

The goal of this research is to assess resource consumption in the built environment. The methodologies applied are statistical analysis and the use of geographical information systems. The combination of these tools helps to determine the factors that determine resource consumption in urban areas and to identify leverage points to reduce consumption. The insights of this analysis can be used to design more effective policies to reduce consumption and related environmental impacts.

David Rua

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **MSc. Electrical and Computer Engineering, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **João Peças Lopes (FEUP), José Ruela (FEUP), Stephen Connors (MIT)**

Integrated Communication Systems for Large Scale Distributed Energy Resources and V2G

The thesis research topic focuses on communication systems that enable the integration of Distributed Energy Resources and Electric Vehicles and their information flow requirements under current and future visions of the electric power systems.

Diego Issicaba

Sustainable Energy Systems PhD
FEUP
Country: **Brazil**
Background: **MSc. in Electrical Engineering, Federal University of Santa Catarina, Brazil**
Starting Year: **2008/2009**
Supervisors: **João Peças Lopes (FEUP), James Kirtley (MIT), Marija Ilic (MIT)**

Research topic

The research aims at developing control strategies for Smart Distribution Grids under Emergency Operation using Agent-based Technology. Such strategies will be designed to achieve a grid with self-healing capabilities, taking advantage of the large scale integration of Distributed Energy Resources (DERs) and Electric Vehicles (EVs).

Ehsan Asadi

Sustainable Energy Systems PhD
FCT-UC
Country: **Iran**
Background: **BSc. Mechanical Engineering – Shahid Chamran University of Ahvaz, Iran; MSc. Energy System Engineering, KN Toosi University, Iran**
Starting Year: **2008/2009**
Supervisors: **Manuel Carlos Gameiro Silva (UC), Carlos Henggeler Antunes (UC), Luis Dias (UC), Leon Glicksman (MIT)**

Refurbishment decision support System for building renovation strategies

Although most European countries have succeeded in reducing energy consumption of new dwellings by more than 50%, these buildings represent only 20% of the building stock. Thus, improving the energetically poor building stock that already exists is crucial. The cyclical nature of the construction industry, the aging rate of existing built environment, the overall reduction in new building construction and the increasing awareness for sustainability, open new opportunities for expanding the refurbishment and reconstruction of buildings. However, refurbishment work is usually complex and heterogeneous; it requires integration of various specialties in highly variable conditions. Therefore stakeholders involved in refurbishment projects can benefit from using decision support tools to analyze and select the most suitable refurbishment actions. Accordingly, in exploring the questions of building refurbishment, the aim of this project is to propose a concept for developing a user friendly building condition assessment and refurbishment decision support system, focusing on the organizations responsible for school buildings facing refurbishment decisions, two-dimensional trade-offs between cost and quality, and physical and functional states of building in conducting condition assessment. This decision support system enables these organizations to easily conduct the building condition assessment and offers optimal refurbishment actions considering the trade-off between cost and quality.

Érica Castanheira

Sustainable Energy Systems PhD
FCT-UC
Country: **Portugal**
Background: **MSc. in Energy and Environmental Management, University of Aveiro, Portugal;**
BSc. in Environmental Engineering, Agrarian Polytechnic School of Coimbra, Portugal
Starting Year: **2008/2009**
Supervisor: **Fausto Freire (UC)**

Environmentally sustainable assessment of bioenergy: A life cycle multi – criteria decision – support approach

This PhD proposal addresses the challenge of developing a framework for Life Cycle Assessment (LCA) of bioenergy systems sustainability, able to support bioenergy systems management and to inform industry actors, policy makers and stakeholders. The chain modeling of the production of biomass and its use as an energy carrier will encompass cultivation and harvesting, transport, conversion to bioenergy products and co-products, not neglecting residues and the production and use of subsidiary inputs (e.g., transport fuels and equipment). The methodology aims to innovate and advance the state of the art along three interrelated lines. First of all the LCA will account for land use and land use changes effects. Second, the assessment of bioenergy alternatives will be based on the complementary use of Multi-Criteria Decision Analysis and LCA to helping the interpretation of the results. Third, uncertainty analysis will be embedded throughout all models to be developed.

Filipa Reis

Sustainable Energy Systems PhD
FCUL
Country: **Portugal**
Background: **MSc. Physics Engineering, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **Miguel Centeno Brito (FCUL), Gianfranco Sorasio (WS Energia)**

Development of Photovoltaic Systems with Low Concentration

Photovoltaic is seen as a solution to produce clean electricity during peak demand hours. However, its high cost inhibits its expansion and has led to an increasing bet on concentration photovoltaic (CPV) systems. Today many CPV options are available in the market but the question remains: what is the optimal configuration to significantly reduce the PV electricity cost/kWh? The purpose of the present thesis is to contribute for this answer by focusing on three main steps: (i) understanding the sustainability challenges and a thorough literature review of CPV technologies; (ii) modeling of CPV systems in terms of thermal, electrical, optical and mechanical parameters, (iii) design and test a prototype and implement it into industrial production.

Filipe Sim-Sim

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Industrial Management and Engineering, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisor: **Christos Ioakimidis (IST-UTL)**

Intelligent Multicellular Grids

The research addresses a concept set of Control algorithms for a Multicellular Grid, made of several microgrid units, with very high Renewable resources and Electric Vehicles penetration, that can allow a Load Follows Supply approach.

Gonçalo Mendes

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Environmental Engineering, FCTUNL, Portugal**
Starting Year: **2008/2009**
Supervisor: **Christos Ioakimidis (IST-UTL)**

Research topic

Sustainable planning of distributed generation in forms of microgrids through development of a mixed integer linear algorithm which incorporates not only the economical but also the life-cycle environmental concerns and social implications in the development of such systems. Key tools: DER-CAM, ArcGIS and an LCA software.

Hana Gerbelová

Sustainable Energy Systems PhD
IST-UTL
Country: **Czech Republic**
Background: **MSc. in Power Engineering, Institute of Chemical Technology, Prague, Czech Republic**
Starting Year: **2008/2009**
Supervisors: **Christos Ioakimidis (IST-UTL), Edward S. Rubin (EPP/CMU)**

Carbon Capture and Storage Technology Implementation into the Portuguese Energy System

It involves performance of the Portuguese energy system in the TIMES (Integrated MARKAL/EFOM System), which estimates energy dynamics in national energy systems over a long-term, multi-period time horizon and employment of the IECM (Integrated Environmental Control Model) which completes a picture of the environmental impacts and costs of carbon capture and storage options for fossil fuel power plants in Portugal.

Hrvoje Keko

Sustainable Energy Systems PhD
FEUP
Country: **Croatia**
Background: **BSc. Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia**
Starting Year: **2008/2009**
Supervisors: **Vladimiro Miranda (FEUP), Stephen Connors (MIT)**

Research topic

The topic being researched is management of operational schedules in a complex electric power system that has a diverse generation portfolio where the inclusion of renewables is strong. A generation operational schedule in such a system needs to adequately handle uncertainties from production side (i.e. due to uncertain wind power production), as well as from the demand side. The modeled system should include energy storage in classic and new, more volatile forms, so the existing models will be extended with a stochastic storage concept: an energy storage system whose capacity and stored energy are not constant in time and its behavior is primarily governed by factors external to the electric power system. An example of such storage could be a fleet of electric vehicle batteries.

Leonel Carvalho

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **MSc. Electrical Engineering, FEUP, Portugal**
Starting Year: **2008/2009**
Supervisors: **Vladimiro Miranda (FEUP), James Kirtley (MIT)**

Research topic

This thesis will address problems that may arise from the massive integration of renewable energy in the Power System generation portfolio. The combined stochastic behaviour of renewable energy and of Power System components may jeopardize the continuity of supply. As result a new tool for Power System Reliability Assessment is going to be developed. This tool will allow estimation of realistic reliability indices for each delivery node of the transmission grid. The incorporation of new computing paradigms and the integration of Computational Intelligence algorithms will also be promoted to allow a better representation of flexible models and to achieve reduction in computational effort.

Manuel Silva

Sustainable Energy Systems PhD
FEUP
Background: **MSc. Mechanical Engineering, Engineering Superior Institute of Porto, Portugal**
Country: **Portugal**
Starting Year: **2008/2009**
Supervisors: **Vítor Leal (FEUP), Leon Glicksman (MIT)**

Long-term energy management of buildings based on a vintage stock-model

The work aims to develop a model of the built environment in Portugal, based on the stock-model technique to explore backcasting scenarios based on mid-term targets, with an emphasis on identifying the best measures and the necessary policies to achieve these mid-term goals.

Nelson Brito

Sustainable Energy Systems PhD
FCT-UC
Country: **Portugal**
Background: **MSc. Architecture, University of Coimbra, Portugal**
Starting Year: **2008/2009**
Supervisors: **Manuel Carlos Gameiro Silva (UC), Leon Glicksman (MIT)**

Retrofitting opportunities for buildings in historical centers

The purpose of this thesis is to provide a contribution towards the integration of energy efficiency and sustainability issues in the context of the historical center. Through a case-study approach, the retrofitting of a building in the Historical Center of Coimbra, a bridge between state of the art scientific knowledge, practical experience, existing and expected legislation, public stakeholders, uniqueness and expected users will be established within this highly constrained context. Having in mind that the historical centers are a reference for the inhabitants of a city, the inclusion of energy efficiency and sustainability efforts may contribute as milestones on a global effort: the retrofitting process must encompass the citizens' needs and take part on their expectations.

Nuno Santos

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Mechanical Engineering, MSc. in Energy, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **Carlos Augusto Santos Silva (IST-UTL), Leon Glicksman (MIT)**

Research topic

Focused in a project called Net Zero Energy School, I will try to prove, making use of some multi-disciplinary approaches, that schools are good places to invest in energy training. The main objective is to achieve the enlarged "School Energy System": not only the building, but the community (direct and indirect) that uses the school. Addressing the homes of the students, the teachers and all the auxiliary staff, first activities will take place at the school building, but I will try to scientifically measure the spill-over effect, linking the degree of energy efficiency improvement of the home with the lessons learned by the students.

Pedro Gonçalves

Sustainable Energy Systems PhD
FCT-UC
Country: **Portugal**
Background: **MSc. Mechanical Engineering, University of Coimbra, Portugal**
Starting Year: **2008/2009**
Supervisors: **Adélio Rodrigues Gaspar (UC), Manuel Carlos Gameiro (UC), Leon Glicksman (MIT)**

Exergy-Economics Analysis of Energy Buildings Systems

This research regards the use of the exergy analysis method, a thermodynamic analysis technique based on the second law of thermodynamics that is used for assessing the performance of and locating irreversibilities within the whole HVAC system. For the improvement of cost effectiveness of the system, an exergy-cost analysis is used regarding the cost minimization of the final products produced by the system. The main objectives of this research work are the development of new exergy efficiency indicators, methodologies and innovative solutions for environmentally safer, sustainable low-exergy buildings.

Reza Fazeli

Sustainable Energy Systems PhD
FEUP
Country: **Iran**
Background: **MSc. Energy System Engineering, Sharif University of Technology, Iran; BSc. Mechanical Engineering, University of Tehran, Iran**
Starting Year: **2008/2009**
Supervisors: **Vitor Leal (FEUP), Jorge Pinho Sousa (FEUP), Stephen Connors (MIT)**

Development of a multi criteria decision procedure to assist the design of pathways for sustainable road transportation

Focused on Light Duty Vehicles. This research aims at developing a multi-criteria evaluation framework for alternative fuel/ technology options for light-duty vehicles in a mid-term horizon. Such a framework is intended to assist policy makers and governments to take decisions concerning the development of infrastructures or the establishment of incentives to promote alternative fuel vehicles with a mid-term vision.

Rui Bernardo

Program: Sustainable Energy Systems
IST-UTL
Country: **Portugal**
Background: **BSc. in Electrical Engineering , IST-UTL**
Starting Year: **2008/2009**
Supervisors: **Luís Marcelino (IST-UTL), Stephen Connors (MIT)**

Research topic

Definition of methods and models to compute estimations of real-time grid operating status and grid optimal power flow for steady-state and non-steady-state operation, under scenarios of uncertain data monitoring and considering risk management of equipment; Framework for optimal grid planning tool that shall work directly over data coming from the operation and control model

Sérgio Casimiro

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Environmental Engineering, FCT-UNL, Portugal**
Starting Year: **2008/2009**
Supervisors: **Christos Ioakimidis (IST-UTL), David H. Marks (MIT)**

Research topic

Analyze how CSP technologies can become a viable alternative to be implemented in Portugal for Energy generation, and extrapolate as to how could it be deployed in a similar region such as the Northern part of the Mediterranean.

> 2009/2010

Vasco Granadeiro

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Civil Engineering, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **José Pinto Duarte (FA-UTL), João Ramôa Correia (IST-UTL), Vítor Leal (FEUP), William J. Mitchell (MIT)**

How to build in large scale with sustainability

Mass customization is the adopted concept to develop large scale construction and, based on this, a modular building system will be created for housing in particular. To address sustainability, customized building design proposals will be tested and optimized for minimum energy consumption in a life cycle approach, focusing on two aspects of greater impact: materials (embodied energy) and operation (operating energy).

Alexandre Lucas

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **Lic., Electrical Engineering, MSc. in Strategic Management, ISEL, Portugal**
Starting Year: **2009/2010**
Supervisors: **Paulo Ferrão (IST-UTL), Carlos Silva (IST-UTL), Stephen Connors (MIT)**

Research topic

The aim of the investigation is to analyse renewable off-grid systems in isolated communities, in particular islands, regarding its sustainability considering the environmental, social and economic dimensions. For this, a case study approach will be used on Corvo Island within the Green Islands Project. The study will consider an island as a system that can benefit from RER implementation, not only for electricity use but water, heat, transportation among other uses.

Anabela Carvalho

Sustainable Energy Systems PhD
FCT-UC
Country: Portugal
Background **MSc. in Systems and Automation (2003), FCTUC – University of Coimbra**
Starting Year: **2009/2010**
Supervisors: **Aníbal Traça de Almeida (UC), Manuel Carlos Gameiro (UC)**

Thermal energy storage control for air conditioning systems based on ground source heat pump

The main goal of this thesis proposal is to analyze the feasibility and to optimize the implementation of a latent heat storage system (LHS) coupled to a ground source heat pump (GSHP) in an existing building in Coimbra and evaluate their potential for better management of the load profile and large-scale integration of renewable energy sources intermittent.
The work will consist of several steps including: selection of phase change material (PCM), storage system modeling, defining the algorithm control, control and monitoring system associated with the interface with the electricity grid (InovGrid), experimental tests, optimizing the control system in a dynamic electricity pricing context and evaluate technical and economic performance.

António Abreu

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **Electrical Engineering**
Starting Year: **2009/2010**
Supervisor: **João Costa Freire (IST-UTL)**

Research topic

The distribution network is the terminal stage of the power system and ends with consumers. The problems which may be found in the distribution network affect both consumers and utilities. One of these problems is the voltage drop that must be reduced to keep the voltages at load points within standard limits. Therefore, the solution to this problem becomes imperative, that is, the voltage at different nodes of the system must be controlled. To enhance the voltage and to control reactive power, the distribution systems are equipped with a lot of voltage controlling devices such as network restructuring, tapchange transformers, voltage regulators, shunt/series capacitors etc. So, the principal area that needs to be examined more closely is the reduction of distribution power lines losses. The research topic includes the conception of equipments/ devices and algorithms to improve efficiency and the reduction of primary energy but with the same load power demand.

Bernardo Silva

Program: Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **MSc.Electrical and Computer Engineering, University of Porto, Portugal**
Starting Year: **2009/2010**
Supervisor: **Hélder Leite (FEUP)**

Research interests

Protection of networks supplied from inverters. Multi-terminal VSC HVDC – protection of extensive interconnected circuits.

Diana Neves

Sustainable Energy Systems PhD
FCUL
Country: **Portugal**
Background: **MSc. Environmental and Energy Engineering, Faculty of Sciences, University of Lisbon, Portugal**
Starting Year: **2009/2010**
Supervisor: **António Vallera (FCUL)**

Sustainable energy demand of residential buildings: an analysis of heating and electricity demand

Understand the patterns of heating and electricity demand in residential buildings of an island in the Azores, and try to optimize the supply using only renewable energy.

Donald Scott

Sustainable Energy Systems PhD
FCT-UC
Country: Canada
Background: **B.Sc. Computer Engineering, University of Alberta, Edmonton, Canada; Masters in Business Administration (MBA), Queen's University, Kingston, Canada; Postgraduate Certificate in Environmental Management, University of Toronto, Toronto, Canada**
Starting Year: **2009/2010**
Supervisors: **Pedro Manuel Tavares Lopes de Andrade Saraiva (UC), Marco Paulo Seabra dos Reis (UC)**

Research topic

I am investigating the structural and functional differences between the Renewable Energy Industry and other, more established technology-based industries (such as Telecommunications and Biotechnology) in order to determine methods of making Renewable Energy clusters more efficient in the production and diffusion of new technologies.

Eugénio Rodrigues

Sustainable Energy Systems PhD
FCT-UC
Country: Portugal
Background: **Bachelor in Architecture (FAUTL); Postgraduate in Urban Design (ISCTE) and in Occupational Safety and Hygiene (ESTG/IPVC)**
Starting Year: **2009/2010**
Supervisors: **Jan Hensen (University of Technology Eindhoven – UT), Adélio Gaspar (UC)**

Research interests

Integration of Building Performance Simulation tools within Architecture Design practice by helping practitioners in energy conscious decision making when faced with different design solutions.

2009/2010

Helena Monteiro

Sustainable Energy Systems PhD
FCT-UC
Country: Portugal
Background: **Bachelor in Architecture, University of Porto; MSc. in Energy for Sustainability, University of Coimbra**
Starting Year: **2009/2010**
Supervisors: **Fausto Freire (UC), Adélio Gaspar (UC)**

Research topic

Portuguese residential building improvement assessment towards a life cycle zero energy building concept aiming at supporting decision at project level. Analysis of Life cycle trade-offs between energy, environmental and economic aspects towards optimal solutions in the residential buildings context. To assess the life cycle zero energy building concept feasibility: Is it effective? What are the environmental impacts? How much does it cost?

Hermano Bernardo

Sustainable Energy Systems PhD
FCT-UC
Country: Portugal
Background: **MSc. in Electrical and Computers Engineering , University of Trás-os-Montes and Alto Douro**
Starting Year: **2009/2010**
Supervisors: **António Manuel de Oliveira Gomes Martins (FCTUC), Adélio Rodrigues Gaspar (FCTUC)**

Research interests

Energy efficiency in buildings.

Jacob Huber

Program: Sustainable Energy Systems PhD
FEUP
Country: **United States of America**
Background: **MSc. Environment and Resource Management, Vrije Universiteit Amsterdam, Netherlands; BSc. in Toxicology, Oregon State University, USA**
Starting Year: **2009/2010**
Supervisor: **Eduardo Oliveira Fernandes (FEUP)**

Research interests

Energy Efficiency in the Context of the New Energy Paradigm: Smart Cities as Energy Efficiency Actors for the Future.

João Santos

Sustainable Energy Systems PhD
FCT-UC
Country: Portugal
Background: **BSc. in Electrical Engineering, University of Coimbra**
Starting Year: **2009/2010**
Supervisor: **Aníbal Traça de Almeida (UC)**

Research topic

Evaluation of the role and the integration of electric energy storage on zero energy houses and development of electrical management schemes for the house balancing the generation, storage and consumption, in order to optimize the independency, economy or grid support.

Lauro Ribeiro

Sustainable Energy Systems PhD
FCT-UC
Country: Brazil
Background: **MSc. and BSc. in Management / Universidade Federal do Rio Grande do Sul (UFRGS) (Brazil)**
Starting Year: **2009/2010**
Supervisor: **Patrícia Pereira da Silva (UC)**

Research topic

The proposed study aims to examine the economic viability of companies that are cultivating microalgae in a large-scale with biodiesel production and assess the economic and technological factors that could be critical to the success of this technology.

Leonardo Bremermann

Program: Sustainable Energy Systems PhD
FEUP
Country: **Brazil**
Background: **MSc. in Electrical Engineering, BSc. in Electrical Engineering, Pontifícia Universidade Católica do Rio Grande do Sul, Brazil**
Starting Year: **2009/2010**
Supervisor: **Manuel Matos (FEUP)**

Research interests

Impact evaluation of the large scale integration of electric vehicles in the security of supply.

Luís Freitas

Program: Sustainable Energy Systems PhD
FEUP
Country: **Venezuela**
Background: **MSc. in Power Electric Systems, BSc. Electrical Engineering, Simón Bolívar University, Venezuela**
Starting Year: **2009/2010**
Supervisor: **Teresa Ponce Leão (FEUP)**

Stability Control for Systems with High Renewable Energy Penetration Based on Synchrophasor

Luis Augusto

Sustainable Energy Systems PhD
IST/ISEG-UTL
Country: **Portugal**
Background: **BSc. Mechanical Engineering, IST-UTL, Portugal; Degree in Economics, ISEG-UTL, Portugal; Post Graduation in Management, ISCTE, Portugal**
Starting Year: **2009/2010**
Supervisors: **Not yet defined**

Research interests

Energy storage, H_2, DSM, Real Options, Offshore Wind, Solar.

Manuela Carreiras

Sustainable Energy Systems PhD
FCT-UC
Country: **Portugal**
Background: **MSc. in Environmental Management, Materials and Waste Valorization, Aveiro University; BSc. in Environmental Engineer, Escola Superior Agrária de Coimbra**
Starting Year: **2009/2010**
Supervisors: **Carlos Henggeler Antunes (FCTUC and INESCC), Luís Dias (FEUC)**

Establishment of a methodology for decision support to local energy planning

Sustainable energy planning at regional/local level.

Mathieu Richard

Sustainable Energy Systems PhD
IST-UTL
Country: **France/Canada**
Background: **MSc. Physics, Imperial College London, UK; MA International Economics and Development, Institut d'Etudes Politiques (Sciences-Po) Paris, France; DESS Energy Policy and Economics, Université de Paris-Nanterre, France**
Starting Year: **2009/2010**
Supervisors: **Jorge Vasconcelos (IST-UTL), Tiago Domingos (IST-UTL)**

Research interests

Energy markets & regulation (with large scale deployment of renewable sources); energy and climate policy.

Nilton Oliveira

Sustainable Energy Systems PhD
FCT-UC
Country: Portugal
Background: **MSc. in Mechanical Engineering , University of Coimbra**
Starting Year: **2009/2010**
Supervisor: **Adélio Manuel Rodrigues Gaspar (UC)**

Research interests

My interest is in simulation systems integrated in thermal building simulations.

Onésimo Silva

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Mechanical Engineering, IST-UTL, Portugal**
Starting Year: **2009/2010**
Supervisor: **Carlos Augusto Santos Silva (IST-UTL)**

Energy efficiency of buildings of a university campus

The energy use in buildings is closely related to their operational and space utilization characteristics as well as to the behaviour of their occupants. As so, it is important to quantify the weight of user behaviours on the energy balance, in order to design more passive and efficient buildings.

Pedro Fazenda

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. in Systems, Decision and Control, IST-UTL, Portugal**
Starting Year: **2009/2010**
Supervisor: **Pedro Lima (IST-UTL)**

Research interests

Intelligent energy systems, intelligent building management systems, knowledge representation, data mining, optimization and machine learning

Pedro Vicente

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc. Electrical Engineering and Computers, IST-UTL, Portugal**
Starting Year: **2009/2010**
Supervisors: **António Falcão (IST-UTL), Luís Gato (IST-UTL)**

Research topic

Analysis and simulation of the dynamic behavior of arrays of offshore wave energy point absorbers, in a configuration that could reduce the cost of the moorings systems and simplify some technical issues, in which, only the converters in periphery are moored to the bottom and the remaining are connected to adjacent elements, and taking into account the system nonlinearities through the use of a proper time-domain model.

Ricardo Abrantes

Sustainable Energy Systems
FCT-UC
Country: Portugal
Background: **MSc. Mechanical Engineering – Faculty of Science and Technology of University of Coimbra**
Starting Year: **2009/2010**
Supervisor: **Manuel Carlos Gameiro (UC)**

Research topic

Pre-compression Cycle – application study and sustainability analysis, study of the pre-compression cycle applied to internal combustion engines using oxygen and hydrogen.

Ricardo Bessa

Program: Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **MSc. in Data Analysis and Decision Support Systems, Faculty of Economics, University of Porto; Lic. Electrical and Computer Engineering, FEUP, Portugal**
Starting Year: **2009/2010**
Supervisor: **Manuel Matos (FEUP)**

Development of Methodologies for Technical and Economic Management of Aggregation Agents of Electric Vehicles

Rita Paleta

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc Mechanical Engineering, IST-UTL, Portugal**
Starting Year: **2009/2010**
Supervisor: **Carlos Silva (IST-UTL)**

Research interests

Renewable energy, energy efficiency, optimization methodologies, remote autonomous energy systems.

Sophie Ndiaye-Zhadeev

Sustainable Energy Systems PhD
FCT-UC
Country: Senegal
Background: **MSc. in Electrical Engineering (USA), BSc. in Electrical Engineering (France)**
Starting Year: **2009/2010**
Supervisors: **Carlos Henggeler Antunes (UC), Humberto Jorge (UC)**

Research interests

Distributed energy resources and electric power network planning.

Vanessa Mateus

Sustainable Energy Systems PhD
FEUP
Country: **Portugal**
Background: **MSc. Environmental Monitoring, Modeling and Management, King's College London, UK; BSc. Landscape and Biophysical Planning and Management, Évora University, Portugal**
Starting Year: **2009/2010**
Supervisor: **Eduardo de Oliveira Fernandes (FEUP)**

Research interests

Energy efficiency in cities, setting a hierarchy of measures for energy savings in the urban context.

Vasco Portugal

Sustainable Energy Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Architecture Design, FA-UTL, Portugal; MSc. in Advanced Architecture, UPC-IaaC, Portugal**
Starting Year: **2009/2010**
Supervisors: **Manuel Arriaga Brito Correia Guedes (IST-UTL); Vallentyne Vinod Niranjan Kishore (TERI University); Chhaya Neelkanthray Hariprasad (School of Architecture, CEPT, Ahmedabad)**

Sustainability for a Developing Context

The research addresses sustainability for a developing context, through exploration of passive design, supported with technology to accomplish self-sufficiency in Architecture. Integrated in the sustainable built environment research field, I propose to follow a new branch of study that focuses on discovering new tools to react to the complex issues of a developing country.

MIT Portugal

Transportation Systems

> 2007/2008

Alda Mendes

Transportation Systems PhD
FEUP
Country: **Portugal**
Background: **BSc. in Civil Engineering (Urban Planning Transportation and Management), IST-UTL, Portugal; Postgraduate studies in Management (Marketing), ISCTE, Portugal**
Starting Year: **2007/2008**
Supervisors: **Álvaro Costa (FEUP), Richard de Neufville (MIT)**

Air transportation for effective and efficient service to small remote communities: policy options under regulatory reform

Carlos Azevedo

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **Diploma in Civil Engineering (Structural Engineering), MSc. in Transportation, IST, Portugal.**
Starting Year: **2007/2008**
Supervisors: **João Cardoso (LNEC), Moshe Ben-Akiva (MIT), José Viegas (IST-UTL)**

Safety criteria for the management of variable speed limits

The proposed research aims to understand how infrastructure related Intelligent Transportation Systems may affect driver behaviour on urban motorways, and identify which of the related changes may influence the road safety level. As mains results the development of a method for estimating accident frequencies in urban motorways, using a micro-simulation application, and its application in the identification of the best strategies and benefits of Variable Speed Limits systems are expected.

Diana Ferreira

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc in Computer Engineering, FCTUC, Portugal**
Starting Year: **2007/2008**
Supervisor: **João de Abreu e Silva (IST-UTL)**

Intelligent Transportation Systems: fighting parasite circulation through online parking space reservations

The goal is to conceptualize, develop and evaluate a web-based system of parking space reservations in urban areas with the goal of helping relieve parasite circulation (the one derived from cruising for parking). The system is to be conceived with consideration to transport and parking policies, in ways not to further incentivize car use, but rather provide an added-value service that can introduce compensations to the remaining mobility system, as well as promoting modal transfer.

Rafaela Arriaga

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **MSc in Logistics, Massachusetts Institute of Technology, USA**
Starting Year: **2007/2008**
Supervisors: **José Manuel Viegas (IST-UTL), Moshe Ben-Akiva (MIT), Cláudia Carvalho (ISPA)**

Research topic

Development of a disaggregate travel behaviour model which directly predicts 65+ years of age traveller's modal switching behaviour due to either a transport service change or a change in individual's ability to drive.

Rui Santos

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. in Civil Engineering, FEUP, Portugal; Post-graduation in Transportation, IST, Portugal**
Starting Year: **2007/2008**
Supervisor: **Paulo Teixeira (IST-UTL)**

Research topic

Efficient track maintenance planning for high-speed railways, based on adequate track quality standards, track availability for maintenance and proper logistical operation of machinery and crews.
Expected results could contribute to the estimation of lifecycle costs in track maintenance and the design of required logistical means.

Abdur Berawi

Transportation Systems PhD
FEUP
Country: **Indonesia**
Background: **BSc. Civil Engineering, University of Lampung, Indonesia; MSc Management Economics and Industrial Engineering, Politecnico di Milano, Italy**
Starting Year: **2008/2009**
Supervisors: **Raimundo Delgado (FEUP), Rui Calçada (FEUP)**

Development of railway track degradation model for maintenance optimization on high-speed railways

The research will be focused on the developing the prediction model as well as the identification of the key influencing parameters on the track degradation. By using the degradation model, the evaluation of the track maintenance expenditure and the selection of the most economical maintenance practice could be proposed, that leading to the reduction on the railway infrastructure life cycle cost (LCC).

Ana Costa

Transportation Systems PhD
FCT-UC
Country: Portugal
Background: **MSc Civil Engineering, FCTUC, Portugal**
Starting Year: **2008/2009**
Supervisors: **Paulo Coelho (UC), Maria da Conceição Cunha (UC), Herbert Einstein (MIT)**

Decision aid tools for high-speed rail systems considering risk analysis and management

Robust solutions are to be achieved considering different possible scenarios under uncertainty. Risks taken into account are mainly related with geotechnical and seismic factors.

Ana Galelo

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. and MSc, Spatial Planning Engineering, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisor: **Rosário Macário (IST-UTL)**

Business models in urban logistics

Business models have already shown their efficiency within the ambit of private companies and firms. The benefits achieved through its implementation should also be evident in the logistic field. The aim of the thesis should be to proof that there is potential for private entrepreneurship in the service exploration domain that can be stimulated by public policies.

Diana Leal

Transportation Systems PhD
FCT-UC
Country: **Portugal**
Background: **BSc. and MSc, Civil Engineering, FCTUC, Portugal**
Starting Year: **2008/2009**
Supervisor: **Luís Picado-Santos (IST and UC)**

Goods traffic on high speed railway line Lisbon-Madrid

The cargo delivery on HSR Lisbon-Madrid line will involve the connection to sea ports locate at the south coast of Portugal and to the logistic platforms that serve the objective. It will be based on a fleet model tool capable of generating scenarios to support strategic options on the high speed rail line. This procedure will allow the identification of preferences and concerns from the most important stakeholders involved and evaluate the scenarios through different eras, improve or change their preferences and include or modify the initial scope of the project in study.

Gonçalo Caiado

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Spatial Planning Engineering; MSc, Transportation, IST-UTL, Portugal.**
Starting Year: **2008/2009**
Supervisors: **Rosário Macário (IST-UTL), Carlos Sousa Oliveira (IST-UTL), Joseph Sussman (MIT)**

Modeling the vulnerability of complex transport network systems: an application to seismic risk in urban environment

The purpose is twofold: i) to develop and validate a model to assess urban road network seismic vulnerability; and to elaborate seismic risk reduction strategies in urban road networks. The risk reduction strategies to be proposed will include a set of macro and micro scale solutions to be included in: i) specific instruments; ii) programs; iii) urban planning instruments and policies.

João Pita

Transportation Systems PhD
FCT-UC
Country: Portugal
Background: **MSc in Civil Engineering, FCTUC, Portugal**
Starting Year: **2008/2009**
Supervisors: **António Pais Antunes (UC), Amedeo Odoni, Cynthia Barnhart (MIT)**

Research topic

Development and testing of an airline network design optimization model aimed at helping determining the best way of scheduling air traffic and assigning an aircraft fleet.
The approach includes the consideration of expected delay costs and airline competition within the optimization model.

Jorge Lopes

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Computer Engineering, FCTUNL, Portugal; MSc, Geographic Information Systems, IST-UTL, Portugal**
Starting Year: **2008/2009**
Supervisors: **João Bento (IST-UTL), Moshe Ben-Akiva (MIT)**

Architecture for the integration of dynamic traffic prediction into an advanced traffic management and information system

This research work focus on the analysis, design and development of innovative solutions to improve real-time mobility, increase reliability and mitigate congestion impacts through the improvement of traffic operations and traveler information services.

Maria Spandou

Transportation Systems PhD
IST-UTL
Country: **Greece**
Background: **BSc. Rural and Surveying Engineering; MSc. in Organization, Design and Management of Transport Systems, Aristotle University of Thessaloniki, Greece.**
Starting Year: **2008/2009**
Supervisors: **Rosário Macário (IST-UTL), Joseph Sussman (MIT)**

Institutional design as a performance factor in urban mobility systems

Study of causal relationships between institutional environment, institutional arrangements, and institutional performance, through an interdisciplinary approach. Focus on the influence and impacts of institutional change, decision-making mechanisms, and stakeholders´ interrelations to the overall performance of the system. Utilization of performance measures to improve institutional structures.

Rui Gomes

Transportation Systems PhD
FEUP
Country: **Portugal**
Background: **MSc Computer Engineering, FEUP, Portugal**
Starting Year: **2008/2009**
Supervisors: **Jorge Pinho de Sousa (FEUP), Teresa Galvão Dias (FEUP)**

Research topic

Providing quality public transportation is extremely expensive in low demand scenarios. Dynamic vehicle routing for demand responsive transportation systems addresses this problem with routes and frequencies that may vary in real-time according to actual demand. Main topics are: Combinatorial optimization, Meta-heuristics, Decision Support System and Demand Responsive Transportation systems.

> 2009/2010

Tiago Fernandes

Transportation Systems PhD
FCT-UC
Country: Portugal
Background: **MSc. Computer Engineering, FEUP, Portugal.**
Starting Year: **2008/2009**
Supervisor: **Francisco Câmara Pereira (UC)**

Traffic Forecasting with DynaMIT, genetic programming, genetic algorithms and neural networks

The main objective is the research of new ways for traffic status forecasting in a real environment, using historical and real-time data from heterogeneous sources (such as road sensors, toll collection and cell phone activity).

Afshan Aman

Transportation Systems PhD
FEUP
Country: **Pakistan**
Background: **MSc, Embedded Systems Informatics, RWTH Aachen, Germany and University of Trento, Italy (double degree)**
Starting Year: **2009/2010**
Supervisors: **Not yet defined**

Research interests

Optimization of urban and regional transport plans, and on using GIS or similar software tools to develop Decision Support Systems for urban/regional transport planning.

António Andrade

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **Msc, Civil Engineering, IST-UTL, Portugal**
Starting Year: **2009/2010**
Supervisor: **Paulo Fonseca Teixeira (IST-UTL)**

Life-cycle uncertainty in rail track degradation

This thesis intends to model the uncertainty associated with rail track degradation processes and its impact in decision-making for design, maintenance, inspection and operation of rail track system.

Ashenafi Weldemichael

Transportation Systems PhD
FCT-UC
Country: Ethiopia
Background: **BSc. Civil Engineering, Mekelle University, Ethiopia**
Starting Year: **2009/2010**
Supervisors: **António Pais Antunes (UC), Chris Zegras (MIT)**

Multi-objective optimization of land-use/transportation policy decisions

The main objective is to develop an optimization-based tool for assisting local governments in their strategic land-use and transportation decisions regarding the evolution of a city and its surrounding areas.

Carlos Marques

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Engineering and Industrial Management, IST-UTL, Portugal; MSc, Transportation, IST-UTL, Portugal.**
Starting Year: **2009/2010**
Supervisor: **Rosário Macário (IST-UTL)**

Emerging energy and technology patterns in transportation systems and the Kondratieff waves theory

The research hypothesis proposed is that the long waves theory associated to system dynamics' modeling constitutes a sound scientific predictive approach, allowing to develop a framework to help structuring the possible pathways for the next energy and technological paradigm shift in transportation , across the first half of the XXI century.

Filmon Habtemichael

Transportation Systems PhD
FCT-UC
Country: **Eritrea**
Background: **BSc. Civil Engineering, University of Asmara, Eritrea**
Starting Year: **2009/2010**
Supervisor: **Luís Picado-Santos (IST, UC)**

Active traffic management for increased safety, efficiency and sustainability of motorways

The project is about actively managing motorways in real-time basis by treating the infrastructure as a mega-sensor and relating it with in-vehicle systems. It looks for eliminating (and/or regulating) speed difference between vehicles with in a lane and across lanes as well. In doing so, the driver´s and his/her vehicle competence will also be accessed for better throughputs of available capacity, increased safety and probably reduction in emission which secures sustainability of motorways.

Francisco Furtado

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Civil Engineering, IST-UTL, Portugal**
Starting Year: **2009/2010**
Supervisor: **José Manuel Viegas (IST-UTL)**

Research interests

Logistics, railways, operational research, namely on network analysis through simulation and optimization. Currently employing agent based simulation to make an analysis on railroad network timetables and identification of capacity problems.

Frederico Morgado

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. and MSc. in Mechanical Engineering, IST-UTL, Portugal.**
Starting Year: **2009/2010**
Supervisor: **Rosário Macário (IST-UTL)**

Airport demand management – a hybrid approach

Demand management is a recognized tool for dealing with airport congestion when demand exceeds capacity. Administrative, economic and hybrid (combination of the previous two) measures can be adopted to shift demand to off-peak hours or to alternate airports. The aim of the current work is to search for optimal economic measures under some administrative constraints, and see the effect of such approach towards maximization of airport profit, society welfare or other.

Gonçalo Santos

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Civil Engineering, FCTUC, Portugal; MSc, Transportation, IST-UTL, Portugal.**
Starting Year: **2009/2010**
Supervisor: **José Manuel Viegas (IST-UTL)**

Car-sharing systems

João Almeida

Transportation Systems PhD
IST-UTL
Country: **Portugal**
Background: **BSc. Electric and Computer Engineering, IST-UTL, Portugal; MSc, Computer Engineering, IST-UTL, Portugal; Post-graduation in Business Administration, FEUNL, Portugal**
Starting Year: **2009/2010**
Supervisor: **Rosário Macário (IST-UTL)**

Citizen-centric approach for integrated smart-mobility and city-services

Merkebe Demissie

Transportation Systems PhD
FCT-UC
Country: Ethiopia
Background: **BSc. Textile Engineering, Bahir Dar University, Ethiopia; MSc. Transport Systems, Royal Institute of Technology (KTH), Sweden.**
Starting Year: **2009/2010**
Supervisor: **Pedro Bizarro (UC)**

Research interests

Public transportation; specifically Bus Rapid Transit (BRT), Demand Responsive Transit System (DRTS) and heavy transit modes like metro and surface train.
Use of simulation models to study various strategies on planning, implementation and operation of BRT. Formulation of new framework for the planning, design, implementation, and operation of BRT. In the area of Advanced Transportation Management System (ATMS): Congestion pricing schemes, parking pricing and enforcement, and mobility management in urban environment.

Mohammad Hajizamani

Transportation Systems PhD
IST-UTL
Country: **Iran**
Background: **BSc. Civil Engineering, Iran University of Science and Technology; MSc, Transportation Planning, Imam Khomeini International University (Iran)**
Starting Year: **2009/2010**
Supervisors: **Sílvia Costa Shrubsall (IST-UTL), José Manuel Viegas (IST-UTL), Ana Paiva (IST-UTL)**

Research topic

Employment of innovative methods to provide a lasting significant improvement to road safety by developing the concept and specifications for a system that adjusts the road vehicle's dynamic attributes to the driver's state (permanent and short-term limitations) and driving circumstances.

Design and Graphic Production
Duarte Ferreira | Ivo Ferreira | Vitor Pedro

Printed in Portugal by
AGIR – Produções Gráficas, Lda.
Camarate, September 2010

OUR INDUSTRY AND INSTITUTIONAL AFFILIATES

Education Affiliates

Alstom
Bento Pedroso / Odebrecht
BRISA
IMTT - Instituto da Mobilidade e Transportes Terrestres
Mota-Engil
RAVE / Refer
Siemens

Industrial and Institutional Affiliates

Alfama, Inc.
Altakitin Corp.
Amorim Industrial Solutions
AREAM – Agência Regional da Energia e Ambiente da Região Autónoma da Madeira
ARENA – Agência Regional da Energia e Ambiente da Região Autónoma dos Açores
Associação Industrial Portuguesa – Confederação Empresarial
Associação Empresarial de Portugal – Câmara de Comércio e Indústria
BANIF – Banco Internacional do Funchal, S.A.
Bioalvo S.A.
Biotecnol, S.A.
Biotempo Lda.
Biotrend – Inovacao e Engenharia em Biotecnologia, S.A.
Cabo TV Madeirense, S.A.
Celoplás – Plásticos para a Indústria, S.A.
Ciência Viva
Cimentos Madeira, Lda.
CIPAN – Companhia Industrial Productora de Antibiótitcos, S.A.
Continental Mabor Indústria de Pneus, S.A.
Crioestaminal – Saúde e Tecnologia, S.A.
Critical Move, S.A.
DEIMOS,S.A.
ECBio – I&D em Biotecnologia, S.A.
EDP, S.A.
EDP Inovação, S.A.
EFACEC, S.A.
Empresa de Electricidade da Madeira, S.A.
FLAD – Fundação Luso-Americana para o Desenvolvimento
Fomentinvest SGPS, S.A.
Fórum de Administradores de Empresas (FAE)
Galp Energia, S.A.
Grupo Bial
Grupo Frulact
GRUPO SOUSA, Investimentos, SGPS, Lda.
Horários Do Funchal – Transportes Públicos, S.A.
Iber-Oleff – Componentes Técnicos de Plásticos, S.A.
Inapal Metal, S.A.
Inapal Plásticos, S.A.
Martifer, S.A.
M. C. Graça, Lda.
Nutroton Energias, S.A.
Ordem Dos Engheneiros
Proforum – Associação Para o Desenvolvimento da Engenharia
REN – Redes Energéticas Nacionais, S.A.
Rolls-Royce plc (UK)
SGC Energia
Simoldes Plásticos, Lda.
Stemmatters, Biotecnologia e Medicina Regenerativa Lda.
Sunviauto, S.A.
TMG Automotive
Unicer Bebidas, S.A.
Universidade dos Açores
VW Autoeuropa

MIT Portugal

Academic Institutions Providing PhD Degrees in Association

Escola da Engenharia da Universidade do Minho
Faculdade de Ciências da Universidade de Lisboa
Faculdade de Ciências e Tecnologia da Universidade de Coimbra
Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa
Faculdade de Economia da Universidade de Coimbra
Faculdade de Engenharia da Universidade do Porto
Instituto Superior de Economia e Gestão da Universidade Técnica de Lisboa
Instituto Superior Técnico da Universidade Técnica de Lisboa

Other Institutions Involved in R&D Activities

Instituto Politécnico de Portalegre
Instituto Politécnico de Setúbal
Instituto Superior de Agronomia da Universidade Técnica de Lisboa
Instituto Superior de Ciência do Trabalho e da Impresa
Universidade de Aveiro
Universidade da Beira Interior
Universidade de Trás-os-Montes e Alto Douro