



UPC

Energy Research Portfolio

Unitat de Desenvolupament KIC

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1. Introducció

El 24 de gener de 2011 la Unitat de Desenvolupament KIC va organitzar una jornada adreçada als investigadors de la Universitat Politècnica de Catalunya amb l'objectiu d'exposar les oportunitats en matèria de recerca que ofereix l'eina KIC InnoEnergy a la comunitat universitària.

Una de les útils derivades d'aquesta iniciativa va estar la recollida sistemàtica d'informació de la capacitat investigadora en energia dels diferents centres i grups de la UPC.

Resultat d'aquest esforç és aquest document, que recull de manera breu i sintètica una primera aproximació al Mapa de Recerca en Energia de la Universitat.

2. Classificació temàtica dels grups de recerca d'acord amb l'Strategic Energy Technology Plan de la Unió Europea, SET Plan

	Wind	Solar PV	Solar Thermal	Smart Grids	Bioenergy and Biomass	CO ₂ Storage and Absorption/Desorption	Nuclear	Energy Efficiency	Transport Management and Innovation	Sustainable Architecture	Hydro	Materials for Energy Applications
Grup de Recerca	Àmbit Temàtic											
ACES	ok	ok		ok								
BEEGroup	ok	ok	ok					ok			ok	
CBA				ok								
CDEI	ok		ok					ok				
CDIF	ok		ok					ok			ok	
CEA						ok	ok					
CEMAD		ok										
CENIT								ok	ok			
CIEFMA				ok			ok					ok
CISOL		ok						ok		ok		
CITCEA	ok	ok		ok				ok				
CoDALab	ok											
CRIT					ok							
GAECE/ECMD	ok							ok				
EOLI	ok			ok								
EPIC		ok						ok				
GCEM	ok			ok								
GEMMA					ok							
GICITED								ok		ok		
GNOM	ok	ok	ok	ok								
GRECDH	ok	ok		ok	ok							
GREP	ok	ok		ok				ok				
GRESA				ok				ok				
GRICCA				ok				ok				ok
ICFO		ok						ok				ok
IE3P	ok	ok		ok				ok				
ISI Group	ok	ok		ok				ok				
ISUPC	ok	ok	ok	ok	ok			ok		ok		
LabH2				ok								ok
LaCàN	ok							ok			ok	
LEAM	ok											
LIAM	ok			ok								
MCIA	ok	ok		ok				ok				
MNT		ok						ok				ok
MTA	ok	ok	ok	ok	ok			ok				
NERG							ok					
POLQUITEX				ok		ok						ok
PROMALS								ok				
PSG				ok								
SARTI				ok								
SEER	ok	ok		ok				ok				
SETRI					ok			ok				
SPCOM				ok				ok				
SUMM Lab	ok	ok	ok	ok	ok							
TE	ok											
TIEG	ok	ok		ok				ok				
TRANSMAR								ok	ok			

3. Grups de Recerca

ACES

Research Centre/Group

Name: ADVANCED CONTROL OF ENERGY SYSTEMS (IOC - IRII)

Acronym: ACES

Web: <http://recerca.upc.edu/aces>

General description of the activity (max 200 words)

The aim of the ACES group is to contribute to the progress of scientific knowledge, the training of specialized personnel and the diffusion of technological advances, in the field of modelling and control of complex systems, and its application to problems related to the generation, conditioning, management and storage of electrical energy.

The facilities of the group include laboratories of control, power electronics, electrical drives and fuel cells, together with the ancillary instrumentation and equipment to perform experimental validations. As for higher education, the group participates at the UPC in four masters (robotics and automation, applied mathematics, engineering mathematics and electronics) and three PhD programmes (Automation Robotics and Vision, Applied Mathematics and Electronics).

Specific areas of research in energy field (max 200 words)

The group focuses its research in the energy field concerning the subject of generation, quality and conversion of Electric power.

The research activities can be divided in the following areas:

- Modelling and control of PEM fuel cells
- Modelling and control of Ethanol Reformers
- Modelling and Control of Power electronic Converters
- Modeling and control of electrical machines

Key words (max 15 items)

- control systems theory
- electric power systems
- fuel cell systems
- power electronics control
- energy management in multi-source electric systems
- electrical energy generation
- reconfiguration and after-blackout recovery of electric power networks
- resources scheduling in power networks operation
- control of complex systems

Research team

Professors, Faculty, Doctorate Holders:

- Carles Batlle I Arnau
- Domingo Biel Solé
- Ramon Costa I Castelló
- Arnau Dòria I Cerezo
- Enric Fossas I Colet
- Jaume Franch I Bullich
- Roberto Griñó Cubero
- Cristian Kunusch
- Josep Ma. Olm I Miras
- Jordi Riera I colomer
- Maria Serra I Prat
- Esther Simó I Mezquita

Doctoral Candidates:

- Niliana Carrero Candelas
- Vanesa García
- Attila Husar
- Mauricio Primucci
- Germán Andrés Ramos Fuentes
- J.R. Rodríguez Villareal
- María Sarmiento Carnevali

Technical Staff:

- Miguel Allué Fantova
- Rafael Cardoner I Parpal
- Víctor Repecho del Corral

Contact

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- Enric Fossas Colet (enric.fossas@upc.edu) Institut d'Organització i Control de Sistemes Industrials (IOC), Universitat Politècnica de Catalunya (UPC), Campus Sud Edifici H, Avda. Diagonal 647, pl. 11, 08028 Barcelona Tel: (+34) 934.017.779, Fax: (+34) 934.016.605

BEEGroup

Research Centre/Group

Name: CIMNE Building Energy and Environment Group

Acronym: CIMNE BEEGroup

Web: www.cimne.com/beegroup

General description of the activity (max 200 words)

The International Centre for Numerical Methods in Engineering is an autonomous research and development centre dedicated to promoting and fostering advances in the development and application of numerical methods and computational techniques for the solution of engineering problems in an international context.

Within CIMNE, the Buildings Energy and Environment (BEE) group are responsible developing initiatives related to promoting Renewable energy sources (particularly wind, solar thermal and solar photovoltaic) and increasing Energy Efficiency in the buildings, public and industrial sectors.

Specific areas of research in energy field (max 200 words)

The following activities define the priorities currently pursued by BEE group:

- Training: On-line Post-graduate courses.
- R+D: CFD, Hybrid Solar systems PV/T, Energy efficiency.
- Software: Geographical systems; CFD software; Neural Networks
- Consulting: Air flow in external areas, Energy monitoring of buildings
- Advanced Energy Services: System for municipal energy management (SIE)

Key words (max 15 items)

- Energy performance
- Energy efficiency
- Energy management
- Hybrid Solar systems
- Photovoltaic
- Solar Thermal
- Municipal energy management (SIE)
- Building energy management systems
- Energy visualisation systems

Research team

Professors, Faculty, Doctorate Holders: Dr Stoyan Danov

Doctoral Candidates: Jordi Cipriano, Xavier Cipriano, Daniel Pérez, Jordi Carbonell

Others: Mike Barker

Contact

- Mike Barker, Tel: 645 978 824, correu: mbarker@cimne.upc.edu

CBA

Research Centre/Group

Acronym: CBA

Department: Computer Architecture (DAC)

Web: www.cba.upc.edu

General description of the activity (max 200 words)

- Next Generation Network Architectures (Internet)
- Traffic Monitoring and Analysis
- Optical Networking
- Nanonetworking Communications

Specific areas of research in energy field (max 200 words)

- Energy-based ILP formulations
- Energy models
- Energy-aware algorithms and protocols
Distributed energy system & energy-efficient architectures
- Energy-oriented data centers & grid sites
- Energy-oriented network infrastructures

Key words (max 15 items)

- Energy aware DNS and URL forwarding
- GMPLS with energy extensions
- Grooming
- Energy aware RWA
- Energy balanced load
- Sleep mode
- Grid sites

Research team

Professors, Faculty, Doctorate Holders:

Josep Solé-Pareta, Davide Careglio, Germán Santos-Boada

Doctoral Candidates:

Sergio Ricciardi

PFC students:

Jordi Perendreu, Santi Bertolín, José Manuel Pau

Contact

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CDEI

Research Centre/Group

Name: Centre de Disseny d'Equips Industrials

Acronym:CDEI

Web: www.cdei.upc.edu

General description of the activity (max 200 words)

Industrial Equipment Design Centre (CDEI) is a capital goods strategic, innovation, development and optimization services centre that provides companies with competitive advantages.

CDEI is a machine engineering expert centre. Its field of activity ranges from conception, design, simulation and calculations of capital goods and products to prototype management and test.

To satisfy the technological and educational needs of businesses, especially small and medium sized businesses, with regard to the design and development of products and equipment, CDEI offers the following services:

- Collaboration and two-way transfer to business orientated technology.
- Consultation, research and provision of our services to businesses and administrations.
- Education in the design and development of industrial, scientific and recreational products and equipment
- Research in technologies and methodologies for the design of machinery.

Specific areas of research in energy field (max 200 words)

Energy Technologies and the environment

- Environmental analysis of procedural and production equipment.
- Renewable energies: conceptual design and equipment construction.
- Saving energy through designo

Key words (max 15 items)

- Equipment development
- Conceptual design
- Process analysis
- Solar energy
- Wind generator
- Wave energy generator
- Energy consumption
- Mechatronics design

Research team

Professors, Faculty, Doctorate Holders:

- Carles Riba Romeva

Doctoral Candidates:

- Elena Blanco Romero
- Huascar Paz Bernales
- Carles Domenech Mestres
- Sònia Llorens Cervera

Others:

- Andreu Presas Renom (Project Manager)
- Ruben Soto (Doctorate – Engineer)
- Oriol Nomen (Engineer)
- Laura Alvarez (Engineer)
- Joan Mach (Engineer)
- Oriol Pérez (Engineer)

Contact

- Carles Riba : riba@cdei.upc.edu +34 93 401 08 34
- Sònia Llorens: llorens@cdei.upc.edu +34 93 401 08 30

CDIF

Research Centre/Group

Name: CENTER OF INDUSTRIAL DIAGNOSTICS AND FLUID DYNAMICS

Acronym: CDIF

Web: <http://www.upc.edu/cdif>

General description of the activity (max 200 words)

We carry out projects and services in the field of renewable energies especially in hydropower.

Analysis of vibration problems in hydraulic machinery and diagnosis

- On-site measurement and trouble shooting
- Analysis of complex cases using advanced techniques for processing signals and simulations
- Pipe vibrations
- Modal analysis

On-line remote monitoring

- Installation of online monitoring equipment
- Remote supervision of critical machinery from our centre
- Off-site diagnosis when requested

Predictive maintenance

- Setting up of predictive maintenance systems based on vibrations
- Selection of measuring points, positions, acquisition parameters, ranges, alarm levels
- Preparation of databases, measurement paths, etc.
- On-site training of company personnel
- Supervision of measurements made by company personnel

Studies of fluid dynamics

- Analysis of problems
- Experimental measurements
- CFD simulations
- Small-scale laboratory tests

Specific areas of research in energy field (max 200 words)

The CDIF's main areas of research are related to the dynamic behaviour of hydraulic turbines and pump-turbines. Dynamic behavior of airfoils.

We have our own Doctoral Programme: **Fluids, Turbomachines and Fluid Power**. This is a Technical University of Catalonia (UPC) qualification

Fluid dynamic excitation on hydraulic machinery

Rotor stator interaction, cavitation, vortex shedding. Fluid-structure interaction. Unsteady CFD

Structural dynamics

Experimental and numerical (FEM) modal analysis. Fluid-structure interactions. Added mass effects.

CFD Simulation

Numerical simulation of momentum, heat- and mass-transfer problems in turbulent flows related to industrial fluid flows and turbomachines.

Key words (max 15 items)

- Hydraulic machines
- Dynamic behavior
- CFD simulation
- Vibration measurement analysis and diagnosis
- FEM Simulation
- Experimental modal analysis
- Fluid-structure interaction
- Hydropower machinery surveillance
- Failure detection and Predictive maintenance

Research team

Professors, Faculty, Doctorate Holders:

- Eduard Egusquiza, Professor
- Carmen Valero, Associate Prof
- Xavier Escaler, Associate Prof
- Esteve Jou, lecturer
- Alfredo Guardo, lecturer

Doctoral Candidates:

- Oscar de la Torre, Assistant prof
- Alex Presas, Assistant prof
- Huang Xingxing,
- Victor Lissen,
- Unai Fernandez,
- Alfred Fontanals.

Others:

- David Castañer (Tech of Laboratory).
- Paloma Ferrer (Secretary)

Contact

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CEA

Research Centre/Group

Name: Càtedra Enresa-Amphos Sostenibilitat I Gestió de Residus

Acronym: CEA

Web: www.upc.edu/web/CatedraMediAmbient

General description of the activity (max 200 words)

The Enresa-Amphos Chair in Sustainability and Waste Management works in the scientific, technical and societal issues related to the inherent inefficiencies of energy generation. In particular, in Nuclear Waste Management and CO₂ geological storage.

The Chair covers the 3 main areas of the Knowledge Triangle: Education, Research and Technology Transfer.

Specific areas of research in energy field (max 200 words)

The main topics of research in the energy field are:

- Chemical and geochemical issues related to waste management
- Chemical and geochemical aspects of CO₂ storage
- The societal impact of energy and waste infrastructure

Key words (max 15 items)

- CCS
- CO₂ storage
- Nuclear Waste
- Chemistry
- Environmental
- Communication

Research team

Professors, Faculty, Doctorate Holders: Jordi Bruno, Fidel Grandia

Doctoral Candidates: Jordi Pon, Maria Rosa González-Siso

Others:

Contact

- Prof. Jordi Bruno, jordi.bruno@upc.edu

CEMAD

Research Centre/Group

Name: ETSETB - Applied Physics Department " Materials and Devices Electrical Characterisation"

Acronym: CEMAD

Web: www-fa.upc.edu

General description of the activity (max 200 words)

Using carbon nanotubes supplied by different providers, we make carbon nanotubes based thin films, that could be used as flexible transparent electrodes in different applications, including photovoltaic solar cells.

Electrical and spectroscopic (Raman, ESR) characterisation of carbon nanotube composites.
Electrical and spectroscopic characterisation of graphene.

Specific areas of research in energy field (max 200 words)

Carbon Nanotubes composites, as conducting flexible electrodes: obtention and characterisation. Carbon nanotube composites that can improve the performance of organic Solar Cells.

Key words (max 15 items)

- carbon nanotubes composites
- carbon nanotubes based thin films
- flexible transparent electrodes
- Raman espectroscopy
- Electron Spin Resonance spectroscopy

Research team

Professors, Faculty, Doctorate Holders: Dr.Núria Ferrer-Anglada, Prof. TU

Dr. V. Gomis, professor

Dr. J. Garcia, professor

Dr. Ll Benadero, professor

Dr. R Pérez, professor

Dr. E Toribio, professor

Dr D. Ochoa, associated prof.

Dr. V. Moreno, associated prof.

Doctoral Candidates: M. Zahir Iqbal

Others: Jordi Pérez Puigdemont

Aida Abiad

Oriol Lopez

Angel Fabregas

Contact

- Núria Ferrer-Anglada <nuria@fa.upc.edu>

CENIT

Research Centre/Group

Name: CENIT – Centre d’Innovació del Transport

Acronym:

Web: www.cenit.cat

General description of the activity (max 200 words)

CENIT’s scope of activities includes generating knowledge and transferring it to the society through research, training and technology transfer in the fields of transportation, logistics and mobility. We use multidisciplinary, scientific and systems approaches to perform quantitative analysis of service, behavior, perception, functionality, sustainability, management, quality, reliability, risk and safety.

Specific areas of research in energy field (max 200 words)

Our activities and research lines include operations analysis, pricing appraisal, demand behavior, optimization in network and route design, location and physical layout: Mobility and urban transport, Railways, Traffic management, Logistics and terminals, Ports and maritime transport, Airports and air transport, safety, security and reliability, ITS, Demand, Financing, Transport system management, PPP, concessions and regulation, Territory and city planning, Environment and energy.

Key words (max 15 items)

- Research
- Transport
- Mobility
- Railways
- Traffic
- Logistics
- Ports
- Airports

Research team

Professors, Faculty, Doctorate Holders: 8

Doctoral Candidates: 3

Others: 30

Contact

- Leif Thorson, leif.thorson@upc.edu

CIEFMA

Research Centre/Group

Name: Structural Integrity and Reliability of Engineering Materials

Acronym: CIEFMA

Web: www.ciefma.es

General description of the activity (max 200 words)

CIEFMA is a Research Center of the Universitat Politècnica de Catalunya (UPC) whose main aim is to carry out basic science and applied industrial research projects on the field of Structural Integrity, Micromechanics and Reliability of Engineering Materials. Concerning research subjects, CIEFMA's activities are mainly focused in five specialized areas: (1) structural integrity retention under service conditions of structural (stainless steels, titanium alloys, composites) and tool materials under quite diverse range of applications; (2) mechanical behavior of advanced ceramics and multilayer composites, at both room and high T's; (3) microstructural design of metallic alloys processed by different manufacturing routes; (4) contact behavior of advanced structural materials; and (5) micromechanics and nanomechanics of both thin films and thick (e.g. thermal- and environmental barrier) coatings. The facilities used for conducting the referred investigations are mechanical testing systems as well as scanning and transmission electron microscopes. Mechanical testing facilities include capabilities for assessing damage evolution, fracture, fatigue and creep behavior under different environments, at both low and high temperatures, and through a wide range of size scales, i.e. from macro- to nano-levels. Micro- and nanomechanical approaches are worked out in close collaboration with UPC's Center for Research in NanoEngineering (CRnE).

Specific areas of research in energy field (max 200 words)

Regarding energy-related aspects, CIEFMA's research covers different subjects:

- High-temperature structural materials: Turbine technology // Fission and Fusion Energy: The use of structural materials in new applications involving high-temperature oxidation and corrosion requires advanced materials with optimized properties. CIEFMA is equipped to conduct fracture and fatigue tests at medium (300-600 °C) and high (above 600°C up to 1400 °C) temperatures, and shows an extended expertise in such characterization activities in high-T metallic and ceramic materials.
- Solid Oxide Fuel Cells (SOFC) – Fuel cell technology: SOFCs are an attractive option relative to other fuel cells. CIEFMA's research in this area focused on the optimization of ferritic stainless steels (surface texture) as interconnects as well as assessment of the functional behavior of Yttria Stabilized Zirconia (YSZ) layer as electrolyte (higher ion conductivity combined to reduced thickness).
- Reduction of wear and friction in components: Low friction and hard coatings are increasingly being used to improve the tribological performance of engineering components. Among them, diamond like carbon (DLC) coatings are those of most extended use. CIEFMA's research in this subject aims to optimize the microstructural

design of DLC-coated systems through an understanding of the micromechanical damage resulting from contact and repetitive loading.

Key words (max 15 items)

- High temperature applications – structural materials
- Fracture, fatigue and creep
- SOFCs interconnect (ferritic steels); YSZ
- Surface modification technology
- Wear, friction

Research team

Professors, Faculty, Doctorate Holders: 6 Staff members; 8 PhDs

Doctoral Candidates: 12 PhD candidates

Others: 2 Qualified Technicians

Contact

- Prof. Dr. Luis Llanes (luis.miguel.llanes@upc.edu)

CISOL

Research Centre/Group

Name: CISOL – SOLAR RESEARCH CENTRE ETSAV
Acronym: CISOL
Web: www.cisol.com.es www.low3.upc.edu

General description of the activity (max 200 words)

The CISOL- Solar Research Centre ETSAV promotes sustainable solar projects at the Vallès School of Architecture of the (ETSAV).

As a centre of information, exhibition and documentation of products, systems and projects in the area of sustainable architecture with emphasis in solar systems, CISOL offers a solid base of knowledge about the architectural integration of these technologies.

Its location in the Center of Research and Technology Transfer (CRITT) and its relationship with different departments and research entities in and outside of the Vallès School of Architecture allows a multidisciplinary approach. The CISOL attends requests and collaborations from public administration as well as any other public or private entity.

The CISOL offers services in the field of energetic consultancy, technological training, solar design and bioclimatic architecture with focus on innovation projects and applied research in these areas.

Specific areas of research in energy field (max 200 words)

CISOL has realized projects in the field of building integration of solar technologies, energetic refurbishment and sustainable architecture. In collaboration with public and private entities, CISOL has developed innovative projects and realized applied research as well as studies, reports and publications in these fields.

LOW3 (www.low3.upc.edu) is an energetically self-sufficient solar house which represented the UPC – Barcelona Tech at the international university competition SOLAR DECATHLON EUROPE 2010.

Once converted into *LIVING LAB LOW3* at the Sant Cugat Campus during 2011 the prototype allows the experimentation and evaluation of its bioclimatic systems, its renewable energy systems and its low impact construction systems.

The laboratory counts with a 4,0 kWp photovoltaic installation, thermal collectors integrated in the south façade, a innovative low energy HVAC system and a domotic control system with sensors for temperature, relative humidity, CO₂ concentration and contact sensors for openings.

LIVING LAB LOW3 fosters teaching and research activities in the field of solar architecture, building simulation and scientific performance evaluation of buildings.

SOLAR CUBE (www.cisol.com.es) is an educative and experimental laboratory on solar energy that aspires to create knowledge amongst students about the potential of solar photovoltaic

energy in the field of architecture, helping to develop, in collaboration with companies, innovative solutions for the architectural integration of these technologies.

Key words (max 15 items)

- Solar Architecture
- Building Integrated Photovoltaic (BIPV)
- Energy self-sufficient Buildings
- Low Energy Building
- Bioclimatic Design
- Solar Decathlon Europe

Research team

Professors, Faculty, Doctorate Holders: Joan Puigdomenech, Torsten Masseck

Doctoral Candidates:

Others:

Contact

- cisol@etsav.upc.edu , torsten.masseck@upc.edu , director@etsav.upc.edu

CITCEA

Research Centre/Group

Name: Centre of Technological Innovation in Static Converters and Drives

Acronym: CITCEA-UPC

Web: www.citcea.upc.edu

General description of the activity (max 200 words)

The Centre of Technological Innovation in Static Converters and Drives (CITCEA) belongs to Universitat Politècnica de Catalunya (UPC). The human resources are professors from Electrical Engineering Department of UPC and engineers. All they have expertise in Mechatronics and Enertronics applications, which make possible the improvement of Energy Efficiency in the fields applied.

The Centre has a great knowledge of industrial and social needs due to their constant collaboration, as well as technology transfer and implementation. Within Mechatronics, the Centre works developing electronic and electric equipment, automation, power electronics, communications and control by microprocessor and DSPs. In Enertronic, the Centre works in energy innovation, in all the activities related to the electric sector and the supply of electrical power; from the generation point to the final consumption.

Professors from the Centre participate at Engineering Bachelor and Master degrees of UPC. The Centre also proposes life-long learning activities with the Master in Mechatronics, supported by the Foundation UPC, and professional courses in energy, automation and Mechatronics fields.

Specific areas of research in energy field (max 200 words)

Key words (max 15 items)

- Power electronics.
- Control and communications by microprocessor.
- DSPs and automation.
- Smarts grids and Microgrids
- Renewable energy
- Wind energy
- Photovoltaic energy,
- Electric vehicle
- IEC68150

Research team

Professors, Faculty, Doctorate Holders:

- Prof. Dr. Antoni Sudrià i Andreu, Director of CITCEA-UPC
- Prof. Dr. Joan Bergas Jané

- Prof. Dr. Samuel Garlceran Arellano
- Prof. Dr. Joan Rull Duran
- Prof. Dr. Andreas Sumper
- Prof. Dr. Daniel Montesinos Miracle
- Prof. Dr. Oriol Gomis Bellmumnt
- Prof. Dr. Roberto Villafáfila Robles
- Prof. Dr. Rodrigo Ramírez Pisco

Doctoral Candidates in 2011:

- PhD Marcela Martínez
- PhD Adrià Junyent Ferre
- PhD Paola Pezzini Bianchieri
- PhD Juan Carlos Trujillo
- PhD Udaya Bhasker Manthathi
- PhD Guillermo Martín Segura

Others:

- 8 Project Manager
- 19 Engineer
- 32 Student

Contact

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 - Paz Yáñez Murillo paz.yanez@citcea.upc.edu
- Telf. 93 401 67 27

CoDALab

Research Centre/Group

Name: Control, Dynamics and Applications

Acronym: CoDALab

Web: codalab.ma3.upc.edu

General description of the activity (max 200 words)

CoDALab is a group of people in the Departament de Matemàtica Aplicada III, one of the departments of the Universitat Politècnica de Catalunya.

The group is active in an interdisciplinary intersection of applied mathematics, systems and control theory and engineering. The group covers both theoretical and applied research and has grown through the collaboration with other national and foreign leading research groups.

The group is composed by people with backgrounds in mathematics, physics, control engineering and civil engineering.

Specific areas of research in energy field (max 200 words)

Automatic control of systems with nonlinear components such as hysteresis, couplings and frictions with modelling uncertainties, undesired excitations. Application to control of wind turbines.

Control of vibrations in flexible structures under dynamic excitations, with applications to the floating offshore wind turbine structures to enhance their stability and reliability under wind and sea wave disturbances.

Structural health monitoring and damage identification in smart structures, with application to the floating offshore wind turbine structures to design in line automatic inspection systems robust under uncertain environments and operating conditions.

Key words (max 15 items)

- Modelling and identification.
- Automatic control.
- Passive, active and semiactive vibration control.
- Structural health monitoring.
- Damage identification.

Research team

Professors, Faculty, Doctorate Holders:

- José Rodellar
- Leonardo Acho
- Francesc Pozo

- Luis Mújica
- Yolanda Vidal
- Josep M. Rossell
- Francesc Palacios
- Josep Rubió
- Mauricio Zapateiro
- Mohammed Ismail
- Magda Ruiz

Doctoral Candidates:

- Fahit Gharibnezhad,
- Diego Tibaduiza,
- Maribel Anaya

Contact

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CRIT

Research Centre/Group

Name: Centre for Research and Innovation in Toxicology (Centre de Recerca i Innovació en Toxicologia)

Acronym: CRIT

Web: www.crit.upc.edu

General description of the activity (max 200 words)

CRIT is a member of TECNIO, the IT Network of Innovation support Centres of ACCIÓ and is accredited by Government of Catalonia. CRIT has experimental expertise that involves biodegradation and toxicity determinations and risk assessment of new products with bioassays as well as biomarkers as tools for the prediction of ecotoxic effects on aquatic and terrestrial organisms. In relation to these aspects, the experience of the CRIT-UPC has focused not only in the experimental determination of toxic properties (acute and chronic toxicology) and biodegradability levels, but also in the evaluation of the quality of results obtained with the accepted toxicity testing. CRIT currently organizes European-wide interlaboratory comparison exercises for aquatic toxicity tests (luminescent bacteria, algae, daphnia toxicity assays, and other parameters like AOX and microcystins), to study the inter- and intra-laboratory variability of these assays.

Specific areas of research in energy field (max 200 words)

CRIT has been working in the past three years in R&D of new tools for the assessment of environmental soil quality, in collaboration with the Catalan Waste Agency. Currently CRIT-UPC has a R&D project funded by Spanish Government entitled "Contaminated Soil Biomonitoring: Environmental Risk Assessment (ERA) in invertebrate communities in selected areas of Catalonia" (SOILBIOMONITOR).

CRIT is interested in some aspects related with the research in energy field, mainly the aspects related with the biodegradation processes (aerobic and anaerobic biodegradability), soil bioremediation, by application of the different technologies.

Key words (max 15 items)

- Environmental Toxicology
- Risk assessment
- contaminants
- Toxicity tests
- Biodegradation
- Bioaccumulation
- water
- industrial effluents
- wastes
- soil
- safety
- biomarkers

- in vitro methods
- established cell lines
- Inter-laboratory exercises

Research team

Professors, Faculty, Doctorate Holders:

- Dr. M. Carmen Riva, Ph.D. Biological Sciences. Research Director/Manager of CRIT. Dr. Riva is a scientific researcher since 1990 at the Technical University of Catalonia (UPC), Head of the Environmental Toxicology Laboratory (Intexter, UPC) since 1993 and CRIT Director/Manager since 2006. Her research focuses on aquatic ecotoxicology (acute and chronic toxicity bioassays), biodegradation tests as well as biomarkers as tools to the prediction of environmental effects on aquatic organisms. Dr. M. Carmen Riva has published over 60 papers. Her current research projects include, for instance: development of methodology to study the use of biomarkers in the risk assessment of aquatic and terrestrial toxicology and development of novel tools to assess the quality of suspected contaminated soil.
- Dr. Juan Ribó, Ph.D. in chemical engineering and scientific coordinator at CRIT,
- Dr. Bettina Vallès, Ph.D. in Biological Sciences and laboratory chief at CRIT.
- Dr. Carme Bosch, Ph.D. in environmental chemistry,

Doctoral Candidates:

- Victoria Ochoa (Graduated in Biological Sciences)
- Melissa Faria (Graduated in Biological Sciences)

Others:

- Laia Magnet, Chemistry Technician. Technical Research Support
- Carla Ribalta, Environmental Health Technician. Student in Environmental Sciences
- Emma Peña, Industrial Design Technician / Administration technical support
- Alejandra Méndez, Msc. Sciences of the sea. Technical Research Support
- M^a Angeles Núñez, Msc. In Advanced Biotechnology
- Verónica Jiménez, Biochemical Technician. Technical Research Support
- Collaborators: professors from different departments of UPC, and from IDAEA(CSIC): Dr. Carlos Barata, Ph.D. in Biological Sciences, Dr. Demetrio Raldúa, Ph.D. in Veterinary Sciences, Dr. Joana Damasio, Ph.D. in Biological Sciences (Spain and Portugal) collaborator.

Contact

- Dr. M^a Carme Riva (riva@crit.upc.edu)
- Dr. Juan Ribó (ribo@crit.upc.edu)

EOLI

Research Centre/Group

Name: Industrial Engineering and Logistics

Acronym: EOLI

Web: <http://eoli.upc.edu/>

General description of the activity (max 200 words)

The group carries out research in production/operations management, management science, industrial engineering, supply chain management, and, specifically, goods and services production management, operational research, supply chain logistics, job evaluation and pay equity, work-time planning and scheduling, the design and improvement of methods, and assembly lines. In practical terms, the group develops systems for production management, interactive systems that use mathematical models, and software.

Specific areas of research in energy field (max 200 words)

The overall objective of the research project of EOLI in energy field is focused on the optimization of the design of autonomous systems for rural electrification with renewable energy through the development of models and multicriteria tools to support decision making. Specifically, we study the design of electrification systems based on the use of solar and wind energy combining the use of individual generators and microgrids, both for developed and developing countries. We adapt the constraints and characteristics of promoters (businesses and other institutions) and future users to ensure that the solutions are successful and sustainable over time.

Key words (max 15 items)

- Rural electrification
- Isolated electrification systems
- Wind energy
- Microgrids
- Developed/Developing countries

Research team

Professors, Faculty, Doctorate Holders: Laia Ferrer, Albert Corominas, Rafael Pastor, Anna M Coves, Amaia Lusa, , Ernest Benedito, Alberto Garcia Villoria, Carme Martínez Costa, Jordi Ojeda Rodríguez, Jordi Olivella Nadal

Doctoral Candidates: Bruno Domenech, Matteo Ranaboldo, Joan Triadó

Others: Carles Rúa Costa

Contact

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EPIC

Research Centre/Group

Name: Energy Processing and Integrated Circuits. UPC.

Acronym: EPIC

Web: Under construction

General description of the activity (max 200 words)

The research group Energy Processing and Integrated Circuits (EPIC) belongs to the Universidad Politècnica de Catalunya, Dpt. of Electronic Engineering. For more than 20 years, the group has focused his efforts in the modeling, control, design and implementation of analog electronic circuits and switching power converters. The research activities are supported by research projects funded by public research institutions and private companies at national and international levels. These activities are organized around the advising of doctorate students and the results are regularly published in scientific periodicals and conferences as well as in patent registrations. Teaching activities are mainly focused on energy processing disciplines at graduate, post-graduate and doctorate levels at the Telecommunications Engineering School of Barcelona (UPC).

Specific areas of research in energy field (max 200 words)

The current research focuses on several fields requiring energy and power processing. On one hand part of the research is devoted to the analysis of the problems related with the new trends of distributed energy generation by means of renewable energy sources and their coupling to the mains. The main problems addressed in this field are:

- The study of microgrids stability when both loads and renewable generation increase and how the control of the generators has to be designed.
- The energy sizing (including storage devices) and management of microgrids for different energy-balance profiles and scenarios (grid-connected, islanded...)

On the other hand the research focuses on the power processing required by the energy harvesting concept and its application to different autonomous systems such as sensors networks, as well as to the design of efficient RF switching amplifiers for next generation of mobile communication systems.

Key words (max 15 items)

- Renewable energy sources
- Power processing for energy harvesting
- Grid-connected and stand alone systems
- Microgrids sizing, energy management and control
- Power electronics, modeling and control
- RF switching power amplifiers for mobile communications

Research team

Professors, Faculty, Doctorate Holders: 0, 8, 8 (period 2000-2010)

Doctoral Candidates: 6

Others:

Contact

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GAECE/ECMD

Research Centre/Group

Name: Grup d'Accionaments Elèctrics amb Commutació Electrònica/Electronically Commutated MotorDrives Group

Acronym: GAECE/ECMD

Web:

General description of the activity (max 200 words)

The main objectives of the Electronically Commutated Motor Drives Group are research and technology transfer in electric drives, especially electronically commutated drives and generators, such as new reluctance and permanent magnet electric machines; and the development of advanced technologies for energy saving and new applications of power electronics in the control and regulation of electric motors and drives.

Specific areas of research in energy field (max 200 words)

- Modeling and simulation of electronically commutated motors and generators
- Design and analysis of new structures of switched reluctance electric drives and permanent magnet electric drives, both rotary and linear, fed through static power converters.
- Development of software for CAD of electric motors and drives electric drives
- New electric drives for electric traction
- Generators for low power wind energy
- High efficiency and low impact electric drives

Key words (max 15 items)

- Electric drives
- Electric generators
- Power converters
- Brushless D.C. motors
- Switched reluctance motors
- Hybrid reluctance motors
- Linear motors drives
- Permanent magnet synchronous motor drives
- High efficiency
- Low environmental impact

Research team

Professors, Faculty, Doctorate Holders: Pere Andrada Gascón, Marcel torrent burgués, Balduí Blanqué Molina, José Ignacio Perat Benavides

Doctoral Candidates: José Antonio Sánchez López, Eusebio Martínez Piera

Others: Javier Castro Soriano

Contact

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GCEM

Research Centre/Group

Name: Grup de Compatibilitat Electromagnètica

Acronym: GCEM - UPC

Web: www.upc.edu/web/gcem

General description of the activity (max 200 words)

The Electromagnetic Compatibility Group (GCEM) of the Universitat Politècnica de Catalunya (UPC) offer to industry consulting and research services for companies in EMC area. Our facilities are ready for realising Electromagnetic Compatibility and Electrical Safety tests.

GCEM belongs to TECNIO, the brand name created by ACCIÓ to earmark the centres and stakeholders that specialise in applied research and technology transfer in Catalonia. This serves the twofold purpose of enabling businesses to access leading R&D+i skills and of favouring the competitiveness and international outreach of these centres.

Specific areas of research in energy field (max 200 words)

Electric and hybrid vehicles

Wind aerogenerators

Smarts electric grids

Key words (max 15 items)

- Electromagnetic compatibility

Research team

Professors, Faculty, Doctorate Holders: 5

Doctoral Candidates: 3

Others: 2

Contact

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GEMMA

Research Centre/Group

Name: Grup d'Enginyeria i Microbiologia del Medi Ambient

Acronym: GEMMA

Web: <http://www-ambiental.upc.es/en/index.htm>

General description of the activity (max 200 words)

The GEMMA is a recognized research group by the SGR (Catalan Government). The group leader is Professor Joan García. GEMMA members belong to the Section Sanitary and Environmental Engineering, from the Department of Hydraulic, Maritime and Environmental Engineering of the Technical University of Catalonia. It is emplaced at the School of Civil Engineering of Barcelona.

The group is specialized in investigating non-conventional wastewater and sewage sludge treatment systems, such as constructed wetlands and high rate ponds. The production of bioenergy from wastewater through anaerobic digestion and microbial fuel cells is a complementary research field. Mathematical modelling and Life Cycle Assessment (LCA) of these treatment processes are also undertaken. In addition, it collaborates with the Research Group on Cooperation and Human Development (GRECDH) in the area of Sustainable Energy, through research projects on appropriate technologies for biogas production from organic wastes in developing countries.

The main research areas are:

- 1) Non-conventional wastewater and sludge treatment systems.
- 2) Technologies for the production of bioenergy from wastewater and organic wastes.
- 3) Mathematical modelling of processes.
- 4) Environmental evaluation of treatment systems and technologies for bioenergy production.

Specific areas of research in energy field (max 200 words)

- Anaerobic digestion of algal biomass and sludge from wastewater treatment.
- Microbial fuel cells for electricity generation in constructed wetlands for wastewater treatment.
- Biogas production in low-cost household digesters in developing countries.
- Life Cycle Assessment and Energy Balance of alternative treatment systems.

Key words (max 15 items)

- Anaerobic digestion
- Bioenergy
- Biomethanation
- Constructed wetlands
- Emergent pollutants
- Greenhouse gases emissions
- High rate ponds

- Life cycle assessment
- Methane
- Microbial Fuel Cells
- Modelling
- Multicriteria
- Sludge
- Solid wastes
- Wastewater

Research team

Professors, Faculty, Doctorate Holders:

Joan García

Ivet Ferrer

Jaume Puigagut

Marianna Garfí

Doctoral Candidates:

Enrica Uggetti

Cristina Ávila

Roger Samsó

Fabiana Passos

Others:

Eduardo Álvarez

Javier Carretero

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- Joan García, Tel: 934016464, E-mail: joan.garcia@upc.edu

GICITED

Research Centre/Group

Name: Interdisciplinary Group on Building Science and Technology

Acronym: GICITED

Web: <http://gicited.upc.edu/>

General description of the activity (max 200 words)

GICITED joins researchers from two Departments of the Universitat Politècnica de Catalunya, which develop their activity at the School of Building Construction of Barcelona and share an interest for research in the field of Building Science. Our approach is clearly multidisciplinary, taking advantage of the different training of the group researchers and their previous experience. Although scientific collaborations between the members started before, we were set up as a Group in 2009.

The interest of the group is mainly focused on Building Science and, more specifically, on research into building materials and the simulation of physico-chemical processes from mathematical modelling. We address problems concerning the development of new materials with specific characteristics, the use of non-destructive diagnostic techniques, the evaluation of energetic efficiency and acoustic comfort in buildings, the fire behaviour of materials, the computational simulation and the design of elements for a safer and sustainable building construction.

Specific areas of research in energy field (max 200 words)

Sustainability and energy saving

- Phase Change Materials (PCM's): Application to Building Construction.
- Evaluation of energetic efficiency.

Key words (max 15 items)

- Energetic efficiency
- Sustainable building construction
- Energy savings
- Energy certification of buildings
- Comfort factor
- Use and management
- Analysis of resources consumptions
- Monitoring of consumptions

Research team

Professors, Faculty, Doctorate Holders:

- Ana Lacasta, EPSEB, PhD in Physics, Applied Physics Department
- Inma Rodríguez Cantalapiedra, EPSEB, PhD in Physics and Graduated in Technical Architecture, Applied Physics Department

- Laia Haurie, EPSEB, PhD in Chemistry, Department of Architectural Technology II
- Antonia Navarro, EPSEB, PhD in Geology, Department of Architectural Technology
- Aleix Ciudad, Post-Doc. PhD in Physics. Applied Physics Department
- José Manuel Gómez Soberón, EPSEB, Civil Engineer, Ph.D. of Polytechnic University of Catalonia. Department of Architectural Technology II

Doctoral Candidates:

- Joan Ramon Rosell, EPSEB, Graduated in Technical Architecture and Industrial Organization Engineering , Department of Architectural Technology II
- Joan Formosa, Graduated in Chemistry. PhD student , Applied Physics Department
- Joaquín Montón, EPSEB, Graduated in Technical Architecture. Department of Architectural Technology II
- Francisco Ruiz, EPSEB, PhD student. Graduated in Technical Architecture and Materials Engineering, Department of Architectural Technology II
- Emili Hormías, EPSEB, PhD student, Architect, Department of Architectural Technology

Others:

- Montserrat Bosch, EPSEB, Graduated in Technical Architecture and Humanities Department of Architectural Technology II
- Judith Ramírez, EPSEB, Graduated in Technical Architecture, Department of Architectural Technology II

Contact

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GNOM

Research Centre/Group

Name: Group on Numerical Optimization and Modeling
Acronym: GNOM
Web: gnom.upc.edu; gnom.upc.edu/about-gnom/energy

General description of the activity (max 200 words)

For over two decades the energy team of the GNOM group has been developing and applying advanced optimization procedures as well as mathematical modeling solutions to **Power Systems**. Publicly funded research projects and industrial projects have been carried out over the years on a national and international level with financial support of the Spanish administration and with the cooperation of several European electric utilities. The expertise of the GNOM group in **electricity market optimization** relies on a deep knowledge of the Iberian Electricity Market (**MIBEL**).

- The **short-term** focus (one day to one week) entails the development of stochastic programming models for the joint optimization of the generation bid to the day-ahead, AGC (reserve) and intraday markets, while taking into account futures and bilateral contracts, greenhouse emission constraints and risk.
- In the **medium term** (a few-months to two-years) our procedures address the equilibrium solution of generation planning in pure pool or mixed markets with bilateral contracts, taking into account the impact of wind power and photovoltaic generation, as well as emission caps. Stochastic programming techniques are employed and constraints to limit the risk of profit loss are included.

Specific areas of research in energy field (max 200 words)

- Mathematical modeling of electric power system operation, and of generation management in medium and in short term, and in on-line optimization (state estimation, secure optimum dispatch and contingency analysis)
- Optimal management of classical, low-emission, and emission-free generation technologies in an electricity market.
- Integration of renewable energies in the electricity markets.
- Optimal management and operations of emerging energy technologies (microgrids, wind-hydro systems,...)
- Optimal management of emission limits.

Key words (max 15 items)

- Electricity markets
- Renewable energies
- MIBEL
- Optimization
- Mathematical programming modeling
- Operations research

- Electric power systems
- Electricity generation management

Research team

Professors, Faculty, Doctorate Holders:

- Dr. Narcís Nabona, full Professor (CU) Dept. of Statistics and Operations Research. narcis.nabona@upc.edu
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- Dr. F. Javier Heredia, associate Professor (TU) Dept. of Statistics and Operations Research. f.javier.heredia@upc.edu
- Dr. J. Antonio González, associate Professor (TU) Dept. of Statistics and Operations Research. jose.a.gonzalez@upc.edu
- Dr. Albert Ferrer, associate Professor (TEU) Dept. of Applied Mathematics 1 alberto.ferrer@upc.edu

Doctoral Candidates:

- Ms. Cristina Corchero PhD Student (thesis dissertation scheduled for 2nd February 2011) Dept. of Statistics and Operations Research. cristina.corchero@upc.edu
- Laura Marí PhD Student (FPI granted) Dept. of Statistics and Operations Research. laura.mari@upc.edu

Others: non-UPC researchers collaborators

- Stein-Erik Fleten Associate Professor, Dept. of Industrial Economics and Technology, Norwegian University of Science and Technology (Trondheim, Norway)
- Jacek Gondzio Full Professor, Dept. of Mathematics and Statistics, School of Mathematics of the University of Edinburgh (G. B)
- Eugenio Mijangos Associate Professor, Dept. of Applied Mathematics, Statistics and Operations Research, U. del Pais Vasco
- Adela Pagès Researcher, Norwegian University of Science and Technology (Trondheim, Norway)
- Marcos J. Rider Researcher Dept. of Electrical Engineering Univ. Estadual Paulista, UNESP, (Brasil)
- Miguel Cruz, Project engineer, Power Electronics and Electric Power Grid Area Catalonia Institute for Energy Research.
- Simona Scripante, electricity market analyst. FERSA Energías Renovables

Contact

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GRECDH

Research Centre/Group

Name: Research Group on Human Development and Cooperation

Acronym: GRECDH

Web: grecdh.upc.edu

General description of the activity (max 200 words)

GRECDH is a multidisciplinary research group formed by researchers coming from very different knowledge areas but with common objectives with respect to the research applied to the Cooperation and the Human Development.

GRECDH researchers share the following common objectives:

- To reach transferable results aiming to facilitate the modernization, and improving the quality of life in developing countries, through applied research, technological development and innovation, in appropriate technologies for human development.
- To facilitate the economic, social and capacity development in communities of countries and areas with lower resources, by means of transference of knowledge and technologies, in collaboration with other actors within the field of Development Cooperation and Humanitarian Aid.

Specific areas of research in energy field (max 200 words)

We carry out applied research, technological development and innovation. We aim to reach transferable technological results, which improve the access to energy services in developing countries and the quality of life of rural people.

Fields of applied research:

We work in the access to energy services in isolated rural areas in developing countries for household, community or productive end uses. We mainly focus in the access to clean fuels (as biogas), in improved cook stoves, and in the access to electricity from renewable sources of energy. We have carried out projects in Peru and Nepal and we have established the groundwork to begin projects in Bolivia, Ghana and Mozambique.

Research topics:

- Appropriate energy technologies for human development.
- Electricity generation with micro-wind systems.
- Electricity generation using small size biomass gasification facilities.
- Anaerobic digestion of organic waste for biogas production.
- Stimulation and support of local capacities in the field of energy.
- Rural electrification programs. (planning and intervention methodologies, which include the assessment of local energy resources)

We work jointly with the UPC/CEPIMA research group in the development of CHP systems using downdraft gasifiers fed by biomass residues (agricultural or forest industry wastes).

Key words (max 15 items)

- Sustainable Energy
- Energy access in developing countries
- Biomass & Bioenergy
- Hybrid microgrid systems
- Microwind energy
- Biomass Gasification
- Low cost biodigesters

Research team

Professors, Faculty, Doctorate Holders: 6

Doctoral Candidates: 3

Others: 3

Contact

- Dr. Enrique Velo

Grup de Recerca en Cooperació i Desenvolupament Humà - GRECDH

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GREP

Research Centre/Group

Name: Research Group in Power Electronics

Acronym: GREP

Web: <http://www.eel.upc.edu>

General description of the activity (max 200 words)

GREP is contributing to the field of Power Electronics, focusing on research activities, so research projects and scientific publications, as well as in the development of new technologies, products and services. In all cases, our orientation to research and innovation is aligned with our educational activity in undergraduate, MSc and PhD activity.

Thematically, GREP is applying research to the field of renewable energy management, enabling the optimal energy extraction of the renewable source and the optimal connection to the electrical grid and/or the load, by a proper power electronics system.

The deepest degree of specialization of GREP is in the power electronics systems using multilevel technology and connected to ac systems.

Specific areas of research in energy field (max 200 words)

- Optimal energy extraction and connection to the load in renewable energy systems.
- Application of the power electronics technology to wind energy systems, grid-connected PV systems and stand-alone PV systems.
- Multilevel technology applied to power electronic converters:
 - Synthesis of new topologies and new converters.
 - Development of new modulation strategies with improved performance, in terms of cost, size, distortion reduction, voltage balance, speed of response, ... etc.
 - Development of control strategies for such converters.
- Development of new control strategies to fulfill wind energy challenges in connecting with the grid.

Key words (max 15 items)

- Power Electronics
- Renewable energy
- Wind energy
- PV systems
- Grid-connected PV
- Stand-alone PV
- Multilevel converters
- Modulation
- New converter topologies
- Converter control

Research team

Professors, Faculty, Doctorate Holders: 4

Doctoral Candidates: 2

Others: 1

Contact

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GRESA

Research Centre/Group

Name: Grup de Recerca en Estadística Aplicada

Acronym: GRESA

Web: http://gresa.upc.edu/?set_language=en

General description of the activity (max 200 words)

We conduct research in several areas: design of experiments, Bayesian statistical methods, forecasting, industrial statistics and quality management, modeling, simulation. But our main interest is in collaborating by providing our knowledge of statistical methods with the research of other groups. We can provide expertise in designing and analyzing experiments, modeling complex situations, forecasting and time series analysis, extracting information from complex data bases, etc. And we can do that by using already known statistical methods or by developing, as needed, new or adapted ones. Some relevant examples are our collaborations with CETAQUA (AGBAR) developing a methodology to identify microcomponents of domestic water uses or identifying and predicting water leaks in a complex network, with ITP in designing and analyzing experiments to improve a electron beam soldering process or with BBVA to develop a process improvement methodology based on facts (Evidence Based Management) with an conducted by other to prediction techniques for times series, modeling multivariate analysis or Bayesian statistics.

Specific areas of research in energy field (max 200 words)

Currently we are working on the measure and evaluation of energy savings caused by energy saving measures adopted in non-residential buildings

Key words (max 15 items)

- Design and analysis of experiments
- Data analysis
- Modeling
- Simulation
- Forecasting and time series analysis

Research team

Professors, Faculty, Doctorate Holders: 8

Doctoral Candidates: 4

Others: 1 administrative staff

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GRICCA

Research Centre/Group

Name: Grupo Interdepartamental para la Colaboración Científica Aplicada

Acronym: GRICCA

Web: <http://eprints.upc.edu/producciocientifica/grup/176468>

General description of the activity (max 200 words)

El Grup Interdepartamental per a la Col·laboració Científica Aplicada (GRICCA) està format per professors que desenvolupen la seva activitat professional en diversos departaments de la Universitat Politècnica de Catalunya (UPC). El GRICCA és en si mateix multidisciplinari i neix amb una forta vocació competitiva. El GRICCA orienta el seu coneixement i la seva infraestructura a la recerca en la frontera entre la ciència dels materials, la física aplicada, la mecànica de fluids i l'enginyeria elèctrica.

Specific areas of research in energy field (max 200 words)

- Electric Power Systems
- Super conducting
- Electric propulsion
- Partial Discharges detection

Key words (max 15 items)

- Superconductors
- Electric ships
- Electric cars
- Partial Discharges

Research team

Professors, Faculty, Doctorate Holders:

- Alcala Cabrelles, Jorge
- Barraco Serra, Marc
- Bosch Tous, Ricardo
- Casals Torrens, Pau
- Dalmau Andreu, Roger
- Esque de los Ojos, Daniel
- Fernandez Aguado, Enrique
- Garcia Calvete, Julio
- Gomez González, Sergio
- Lopez Lopez, Jose
- Roe Vellve, Nuria
- Torres Camara, Ricardo

Doctoral Candidates:

Others:

Contact

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- Fernandez Aguado, Enrique (enrique.fernandez@upc.edu)

ICFO

Research Centre/Group

Name: ICFO –The Institute of Photonic Sciences

Acronym: ICFO

Web: www.icfo.es

General description of the activity (max 200 words)

ICFO-The Institute of Photonic Sciences was created in 2002 by the government of Catalonia and the Technical University of Catalonia. ICFO is a center of research excellence devoted to the sciences and technologies of light. The Institute carries out frontier research and trains the next generation of scientists and technologists. ICFO actively collaborates with many leading research centers, universities, hospitals, and a range of private companies based locally and all over the world.

ICFO currently hosts 20 research groups working in more than 50 different laboratories. Available to them are a Nanophotonics Fabrication Lab, a Super-resolution Light Microscopy & Nanoscopy Lab, an Advanced Engineering Lab and a range of other support facilities. All research groups and facilities are located in a dedicated 10.000 m² - building situated in the Mediterranean Technology Park in the metropolitan area of Barcelona.

Research at ICFO is mainly focused on applications in Health, Renewable Energies and Information Technologies, and is conducted in the framework of long-term programs and mid-term projects in a variety of topics, including quantum information technologies, solar cells, nanophotonic devices, remote sensing, optoelectronics, integrated optics, ultrafast optics, biophotonics and biomedical optics, among others. ICFO is currently expanding, thus by 2015 the institute will host some 350 researchers organized in 25 groups. ICFO performs cutting-edge research both in fundamental and applied fields. Spin-off creation by ICFO researchers is also encouraged and promoted. ICFO also hosts an active Corporate Liaison Program (CLP) which serves as a bridge between ICFO researchers and all kinds of industries and corporations.

Specific areas of research in energy field (max 200 words)

Photonics is at the core of all light-harvesting concepts and technologies, particularly in photovoltaics and solar cells, as well as in efficient illumination and lighting.

ICFO has an active Light for Energy Program which targets the challenges in energy efficient applications, developing disruptive approaches to renewable energies. Ongoing projects within the L4E Program include:

- Advanced micro and nano-structured materials to enhance the performance of organic photovoltaic materials.
- Novel nanomaterials and devices for renewable energy applications.
- Low-cost solar cells based on solution-processed materials of high abundance, low toxicity and long-term stability.
- Transparent photonic approaches and ultrathin metal films.

- Low cost highly efficient transparent solar cells and smart windows.
- Efficient lighting applications, organic OLEDs and advanced displays.
- Advanced materials and optoelectronic devices for the photonics industry. These include micro- and nanoengineered electro-optic and acousto-optic modulators for low-power-consumption optical communication, photonic crystal fiber and nanowire sensors for environmental monitoring and aerospace applications, photoelectric, thermoelectric and electromechanical transducers, and energy efficient sensors amongst others.
- ICFO also hosts a variety of projects in nanophotonics, including nano-structured materials, nano-cavities, nano-antennas, low cost material processed nano photonic devices and plasmonic enhanced light harvesting technologies and nanoscale light technologies to be exploited in sensing, nano imaging, optical circuitry and data storage applications.
- ICFO's Light for Energy Program also focuses on establishing links and joint projects with local, national and international research institutions, which develop, use or think of using photonics for energy efficient applications in the future, organizing workshops and conferences as well as fostering spin-off creation, knowledge dissemination and outreach activities. ICFO collaborates with research centers, Universities and corporations worldwide, acting as a Green Photonics Hub.

Key words (max 15 items)

- Photonics
- Optoelectronics
- Organic LEDs
- Light Harvesting
- Advanced Displays
- Transparent electrodes
- Solar Cells, photovoltaic
- Nanomaterials
- Plasmonics etc.

Research team

ICFO currently hosts 20 research groups working in more than 50 different laboratories:

- 20 group leaders
- more than 150 PhD students and Post Doctoral Fellows
- several visiting scientists, summer fellows and industrial collaborators

Contact

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IE3P

Research Centre/Group

Name: Ingeniería de la Energía Eléctrica y Electrónica de Potencia
Acronym: IE3P
Web: <https://www.euetib.upc.edu/la-recerca/grups-de-recerca/ie3p>

General description of the activity (max 200 words)

IE3P es un grupo de investigación en el ámbito de la Energía Eléctrica e Ingeniería Electrónica que prioriza la transferencia de tecnología. Desarrolla sistemas para la medida, la utilización eficaz y el ahorro de energía en procesos de generación y aprovechamiento energético. El grupo está ubicado en la Escuela Universitaria de Ingeniería Técnica Industrial de Barcelona (EUETIB) y su actividad comprende desde el diseño de pequeños sistemas para la microgeneración y almacenamiento de energía eléctrica, hasta el desarrollo de convertidores estáticos de potencia utilizados en tracción eléctrica, energías renovables, mejora de la calidad de la red eléctrica y ahorro de la energía.

Specific areas of research in energy field (max 200 words)

Electrónica de Potencia:

Desarrollo de sistemas de electrónica de potencia y convertidores estáticos para aplicaciones específicas tales como: control de máquinas eléctricas, mejora de la calidad de la energía eléctrica, ahorro energético, equipos especiales de test para componentes eléctricos de potencia, etc.

Incluyendo el desarrollo de micro-convertidores estáticos altamente eficientes para el acondicionamiento de la energía obtenida mediante dispositivos Harvest.

Control digital:

Estudio e implementación de sistemas para el control digital de convertidores estáticos de media y alta potencia, conectados o no a la red eléctrica, implementados mediante el uso, independiente o combinado, de dispositivos de lógica programable (CPLD y FPGA) y dispositivos Microcontroladores y Procesadores Digitales de Señal (μ C y DSP).

Medida de magnitudes eléctricas:

Desarrollo de transductores para la medida de corrientes alternas y continuas, basados en el efecto Flux-Gate, introduciendo mejoras innovadoras en este tipo de transductores y desarrollando nuevos sistemas basados en ese efecto.

Máquinas eléctricas

Desarrollo y optimización de sistemas electromagnéticos, incluyendo su comportamiento térmico, mediante el uso del método de los elementos finitos.

Ver más información en Web.

Key words (max 15 items)

- Power Electronics.
- Active Power Filters.
- Energy harvesting.
- Energy saving systems.
- Street lighting systems.
- Microgrids.
- Smart power.
- Renewable energy.
- Electric power quality.
- Electric machines
- Electromagnetic and thermal fields modeling
- Electric measure transducers.

Research team

Professors, Faculty, Doctorate Holders:

Todos pertenecientes a EUETIB:

Manuel Román Lumbreras (Dr. Ing. Industrial)

Guillermo Velasco Quesada (Dr. Ing. Electrónica)

Alfonso Conesa Roca (Dr. Ing. Electrónica)

Herminio Martínez García (Dr. Ing. Electrónica)

Ramón Bargalló Perpiñá (Dr. Ing. Industrial)

José M^a Huerta Sánchez (Ing. Industrial)

Doctoral Candidates:

Raúl Pérez Delgado (Máster Ing. Electrónica - Investigador)

Others:

Albert Codina Marín (Ing. Tec. Industrial - Investigador)

Sandra Baró Paniello (Ing. Tec. Industrial - Investigadora)

Contact

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ISI Group

Research Centre/Group

Name: Instrumentation, Sensors and Interfaces Group

Acronym: ISI Group

Web: <http://isi.upc.es/>

General description of the activity (max 200 words)

Research on novel sensors and on measurement methods based on electrical impedance variations, and on their electronic interfaces for signal conditioning and processing. Particular interest on macrosensors based on low-cost technologies, autonomous and smart sensors, sensor networks, analog signal processing, data acquisition systems, impedance spectroscopy and tomography, noise and interference reduction in instrumentation, noninvasive physiological measurements and biotelemetry. Technology transfer in sensors and engineering measurement systems.

Specific areas of research in energy field (max 200 words)

Research in energy harvesting methods and circuits for low-power autonomous sensors and Wireless Sensor Networks (WSNs). Particular emphasis in: circuits for extracting the maximum energy from the transducers (MPPT), battery monitoring (SoC, SoH), hybrid storage units, power and energy management. Focus on solar , thermal , and radiofrequency (RF) energy harvesting. Wireless power transfer via inductive coupling and RF transmitters.

Key words (max 15 items)

- Energy harvesting
- Autonomous sensors
- Wireless Sensor Networks (WSNs)
- MPPT
- Solar harvesting
- RF harvesting
- Wireless Power Transfer (WPT)
- Inductive powering
- Magnetic resonance
- Batteries
- SoC
- SoH
- Hybrid storage

Research team

Professors, Faculty, Doctorate Holders: 1 Professor, 6 Associate professors, 3 Assistant professors

Doctoral Candidates: 9 PhD students

Others: 1 Technician

Contact

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ISUPC

Research Centre/Group

Name: Institute for Sustainability

Acronym: ISUPC

Web: <http://is.upc.edu/>

General description of the activity (max 200 words)

The aim of IS.UPC is to serve society towards its transformation to sustainability through research activities, academic programs, and using the University as a living laboratory for sustainability.

Specific areas of research in energy field (max 200 words)

Our group consists of university management staff and researchers, and we carry out applied research on energy management at the University.

Since 2006 we have been carrying out a CO2 emission reduction program at the university buildings, focusing on energy management to reduce consumption.

On the other hand, we intend to include other fields relating energy in the Institute's research activity

Research topics (so far):

- Energy efficiency in buildings
- Organizational change
- Pots-occupancy

Future research topics

- Renewable Energy
- Smart grids
- Biomass

Key words (max 15 items)

- Sustainable Energy
- Energy Performance of buildings
- Post-Occupancy
- Organization change

Research team

Professors, Faculty, Doctorate Holders: 7

Doctoral Candidates: 3

Others: 4

Contact

- Milena Ràfols Salvador
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<http://is.upc.edu/>

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LabH2

Research Centre/Group

Name: Institute of Energy Technologies/Hydrogen Laboratory

Acronym: LabH2

Web: <http://www.upc.edu/inte/en/laboratori.php?id=6>

General description of the activity (max 200 words)

- To design, develop, characterize and test new catalytic devices based on nano- and micro-structures for the generation and purification of hydrogen.
- To develop fuel reformers based on catalytic walls, membrane reactors and microreactors for commercial fuel cell application.
- To facilitate the transfer of technology with private companies and joint ventures interested in hydrogen and fuel cells.

Specific areas of research in energy field (max 200 words)

- Preparation and evaluation of catalysts for the production of hydrogen from conventional fuels as well as bio-fuels.
- Preparation and evaluation of catalysts for selective oxidation reactions and atmospheric pollutant abatement.
- Preparation of catalysts for the production of bio-diesel
- Characterization of catalysts and nanoparticles with advanced techniques, such as high resolution transmission electron microscopy (HRTEM), X-ray photoelectron spectroscopy (XPS), and focus ion beam (FIB).
- Design, modelling, and manufacture of catalytic wall reactors and microreactors for the generation of hydrogen in portable applications.
- Functionalization of silicon structures with catalysts for the manufacture of micro-fuel cells for electronic gadgets.
- Development of membrane reactors for the production and simultaneous separation of hydrogen for fuel cells in mobile applications.
- Design, modelling, control, and manufacture of fuel reformers for the distributed generation of hydrogen for fuel cell feeding.

Key words (max 15 items)

- Technology of hydrogen
- Fuel reformers
- Production of hydrogen from biofuels
- Photoproduction of hydrogen
- Catalyst engineering
- Characterization of catalytic devices
- Membrane reactors
- Microreaction technology for micro fuel cells
- Hydrogen purification

Research team

Professors, Faculty, Doctorate Holders: Prof. Jordi Llorca, Dr. Eduardo López, Dr. Elena Taboada
Doctoral Candidates: Montserrat Domínguez, Cristian Ledesma, Núria Jiménez, Raúl Espinal,
Vanesa García
Others: Alberto Pacheco, Reinhold Koch, Beatriz Sáez, Albert-Octavi Borbón

Contact

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LaCàN

Research Centre/Group

Name: Laboratory de Càlcul Numèric

Acronym: LaCaN

Web: www-lacan.upc.edu

General description of the activity (max 200 words)

During the last decade, the research group LaCàN (Laboratori de Càlcul Numèric) has developed an intensive activity in the field of numerical simulation in applied sciences and engineering. The current upstream research activity of the group can be classified into the following topics:

- Computational Mechanics: Numerical methods for boundary value problems, absorbing boundary conditions, incompressibility, damage models, microstructures, dynamic fracture, vibroacoustics ...
- Validation and Verification: error estimation, adaptive modeling, certificates ...
- Mesh generation, pre and post-processing ...

All these numerical techniques have been applied to a number of different engineering problems. The LaCàN research activity include also tailored modeling solutions, studying particular simulation needs and carrying out the complete simulation loop, from the physical model that accounts for the relevant phenomena, to the selection of the most adequate numerical strategy and the computational solution including pre and post-processing and quality analysis. We have proven expertise in providing simulation solutions to different industrial sectors: automotive, steel construction, nuclear industry, gas suppliers...

Specific areas of research in energy field (max 200 words)

Energy storage: multiscale and multi-physics simulation

The performance and durability of fuel cells and rechargeable batteries is driven by its complex electro-chemo-thermo-mechanical behavior. This requires accounting for microscopical phenomena, such as the motion of ions and defects, at larger scales, coupled with large volume and in some instances temperature changes. Fatigue and fracture often hinder the reliability of these devices. We propose a research task on the multiscale and multi-physics modeling and simulation of the mechanics of energy storage.

Nuclear energy: numerical simulation for nuclear power plant structures and waste containers

Crack opening is a key parameter to estimate the durability of nuclear concrete structures. Cracks are preferential paths along which fluids or corrosive chemical species may penetrate inside concrete structural elements. For structures such as confinement vessels or nuclear waste container, tightness to gas or liquids is a major serviceability criterion. We propose a research on the numerical simulation, ensuring a prescribed accuracy, of the thermo-mechanical behavior including chemical kinetics of structural elements of NPP and waste containers.

Offshore wind and wave energy: simulation and prediction of wind and wave fields, performance monitoring with CFD and Fluid-Structure Interaction.

Offshore farms are of great interest from the energetic point of view (the average wind speed is usually considerably higher over open water) and from the environmental point of view (they are less obtrusive than turbines on land). We propose a research on fluid-structure interaction applied to the design of wind turbines blades and to the interaction between the sea currents and the structure of the offshore wind turbine.

Key words (max 15 items)

- Numerical simulation
- Validation and verification
- Multiscale and multi-physics simulation
- Nuclear structures and containers
- Fluid-structure interaction
- High-order simulation
- Mesh generation

Research team

Professors, Faculty, Doctorate Holders: 15

Doctoral Candidates: 20

Others: 2 research assistants

Contact

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LEAM

Research Centre/Group

Name: Acoustical and Mechanical Engineering Laboratory

Acronym: LEAM

Web: <http://leam.upc.edu>

General description of the activity (max 200 words)

The Acoustical and Mechanical Engineering Laboratory is a research centre of the Department of Mechanical Engineering at the Technical University of Catalonia, located in Terrassa. The center expertise area is the development of noise control techniques focussing both in basic research in acoustics and vibration, and in technology transfer to industry. LEAM has developed technological innovation projects for the industry and public administrations, sometimes as a part of a PhD thesis. The main research areas of LEAM within noise control are:

Active Noise Control: A technique that aims to reduce unwanted noise by destructive interference with an additional acoustic field (right), generated electronically. LEAM is working towards the application of this technique in ducts as a commercial applications (for air conditioning installations), and on the optimization and application of local noise control techniques.

Environmental Acoustics & Vibrations: LEAM is developing statistical sampling strategies to map noise in urban areas by means of direct measurements. Related to the environmental impact of vibrations, LEAM is working towards the creation of a model of the generation, propagation, and transmission into buildings of train generated vibrations.

Measurement systems to identify source in noisy environments: Among others, LEAM is developing a system to monitoring aircraft noise in presence of background noise using microphone arrays.

Noise Emission Control: LEAM applies the knowledge generated in all the other research lines to solve industrial problems related to noise and vibrations control.

Specific areas of research in energy field (max 200 words)

Wind turbine has been rated as more annoying than transportation noise or industrial noise at comparable noise levels, and the proportion of people annoyed increases more rapidly with the sound pressure level than for the other sources. It is true that wind turbine noise currently affects a relative small portion of the population but the number of people exposed is increasing rapidly and disturbance from wind turbines may be an obstacle for large-scale production. Nowadays mechanical noise in wind turbines have been efficiently reduced by manufacturers. Therefore, aerodynamic noise has become the main source and it will become even more important as the size of the wind turbines increase, because mechanical noise doesn't increase with the size as fast as aerodynamic noise. It is necessary to assess the relative importance of the different aerodynamic noise sources in order to be able to efficiently reduce their contribution. LEAM has developed a linear microphone array to locate

and measure sound sources in horizontal axis wind turbines in-situ. Also, LEAM has satisfactorily applied Active Noise Control in order to reduce the ventilation unit noise.

Key words (max 15 items)

- Noise control
- Active Noise Control
- Microphone Arrays
- Vibrations
- Vibrations propagation
- Noise pollution
- Noise Mapping
- Sound source location

Research team

Professors, Faculty, Doctorate Holders:

Doctoral Candidates:

Others:

Contact

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LIAM

Research Centre/Group

Name: Laboratory of Information Analysis and Modelling

Acronym: LIAM

Web: <http://recerca.upc.edu/liam>

General description of the activity (max 200 words)

The objectives of the researchers working at the laboratory are the following: 1. To strengthen the IT skills of academics and other UPC staff who have been working in the fields of modeling, simulation, multivariate analysis of data and information management, so that, as a result of the complementary character of these disciplines, they are able to undertake projects that are more long-term and wider in scope. 2. To carry out research and methodological innovation in the aforementioned fields and their implementation in computer science systems for the solution of scientific and business problems raised by the information society. 3. To take on European leadership in subjects like modeling, simulation, data mining and information analysis.

Specific areas of research in energy field (max 200 words)

- **Space-Time Forecasting System for Wind Power Generation:** The objective of this project is to investigate and develop a methodology which will allow us to make accurate short and medium term wind power forecasts. In this project we have to take into account two important research areas that are absolutely related to each other: a) space-time wind forecasting and b) wind power forecasting in order to get accurate wind power forecasts that will be of great utility for system operators, electricity companies and wind farms builders/managers (Project supported by the Ministerio de Ciencia e Innovación, :DPI2009-14048).
- **Influence of macroeconomic indicators in power prices.** The objective of this research line is to investigate the relationships between electricity spot prices and the macroeconomic indicators as for example USdollar/Euro (USD/Euro) exchange rate and oil prices.
- **Forecasting electricity spot prices.** In liberalized electricity markets, the way the generation companies use to manage their production is to build an hourly bid that is sent to the day-ahead market. The objective of the companies is to maximize their benefits but the price at which the energy will be paid is unknown during the bidding process. This situation makes the spot price forecast an essential point into the electricity management strategies.

Key words (max 15 items)

- Electricity market prices
- Forecasting Electricity Generation Demand
- Electricity Generation "mix"
- CO2 emissions
- Exchange rate

- Oil prices
- Short term forecasting
- Factor models
- Short and long-run relationships
- Cointegration
- Multivariate volatility

Research team

Faculty: M. Pilar Muñoz (UPC), Josep Antoni Sánchez (UPC), Jose Antonio González (UPC), M. Dolors Marquez (UAB), Manuel Oviedo (USC), Montserrat Fuentes (North Carolina State University).

Doctoral Candidates: Lesly M. Acosta, Hajar Nasr, Miguel Angel Valencia

Contact

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MCIA

Research Centre/Group

Name: Motion Control and Industrial Applications

Acronym: MCIA

Web: www.mcia.upc.edu

General description of the activity (max 200 words)

The MCIA belongs to Polytechnic University of Catalonia (UPC). It was founded in 1997 as research group growing until become a leader in electronic systems.

The concrete lines of work of the Centre are:

- Industrial Diagnostic: Evolution towards predictive and remote maintenance and remote.
- Energy management. Evolution towards distributed energy optimization systems.
- Electromobility. Evolution towards an electric car and less pollutant.
- Industrial Electric Drives. Towards an optimized algorithms for control and regeneration
- Communications and systems integration. Electronic Equipment networks

Specific areas of research in energy field (max 200 words)

- Development and integration of Technologies for Electric Vehicles
- Research into systems for the management of the energetic demand in buildings and industrial plants.
- Improvement of the energetic efficiency of components and systems.
- Integral use of Energy and integration of distributed generation systems.
- Development and implementation of renewable energies.
- Conception, design, control and supervision of Electric Distribution Micronets

Key words (max 15 items)

- Energy Optimization
- Electro mobility
- Industrial Electronics
- Drive Control and Mechatronics
- Industrial Diagnostic
- Instrumentation and Communications
- Non Destructive Test

Research team

Professors, Faculty, Doctorate Holders: 6

Doctoral Candidates: 12

Others: 18

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MNT

Research Centre/Group

Name: Micro and Nanotechnology Group

Acronym: MNT

Web:

General description of the activity (max 200 words)

In its Clean Room facilities the group focuses its research on the fabrication of photovoltaic solar cells using different technologies and approach:

- Crystalline silicon Solar Cells
- Heterojunction (amorphous silicon/crystalline silicon) solar cells (HITS)
- Organic solar cells
- Thermophotovoltaic

Specific areas of research in energy field (max 200 words)

- Fabrication of crystalline silicon solar cells (>20%). Optimization passivation layers, laser contact, optical confinement.
- Large area HITS solar cells using PECVD and HWCVD deposition techniques
- Thermophotovoltaic Solar Cells using metallic photonic crystals as intermediate absorber and emitter.
- Organic solar cells based on small molecule semiconductors
- Structural, optical and electrical characterization of semiconductors

Key words (max 15 items)

- Photovoltaic solar cells
- Crystalline silicon
- Amorphous silicon
- Organic semiconductors
- Thermophotovoltaic
- Third generation solar cells (plasmons, up-conversion, down shifting)

Research team

Professors, Faculty, Doctorate Holders: Prof. R. Alcubilla, J. Puigdollers, C. Voz, I. Martín, A. Orpella, P. Ortega, M. Colina,

Doctoral Candidates: D. Hernández, A. Marsal, S. Galindo

Others: M. García, G. López

Contact

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MTA

Research Centre/Group

Name: Enginyeria Ambiental – Modelització i Tecnologia Ambiental

Acronym: MTA

Web: eprints.upc.edu/producciocientifica/grup/176404

General description of the activity (max 200 words)

Group activities in energy field are preliminary and focused on applied energies, including renewable energies. They are intended to increase energy efficiency in industrial activities and tertiary, with special interest in commitment of results to the society (2.0 tools).

Specific areas of research in energy field (max 200 words)

Research areas in energy field are concentrated in developing more efficient energy audit procedures for buildings and industry including energy consumption characterization patterns in such usages.

Key words (max 15 items)

- Energy audit
- Applied energy
- Renewable energy

Research team

Professors, Faculty, Doctorate Holders: Santiago Gassó Domingo

Doctoral Candidates: Daniel Garcia-Almiñana

Others: Sílvia Rodríguez-Donaire

Contact

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NERG

Research Centre/Group

Name: Nuclear Engineering Research Group

Acronym: NERG

Web: <http://www-sen.upc.es/nerg/>

General description of the activity (max 200 words)

The general scope of nuclear engineering is to use the knowledge and scientific methodology to get the profit that for the man can supply the uses of fission and fusion nuclear energy and of the ionizing radiation.

Specific areas of research in energy field (max 200 words)

Nuclear Energy, fission and fusion.

Key words (max 15 items)

- Nuclear power plants
- Nuclear energy
- Nuclear technology
- Nuclear safety
- Probabilistic safety assessment
- Environmental impact
- Ionizing radiation technology
- Radiation protection
- Nuclear fusion
- Nuclear instrumentation
- Radioactive waste
- Nondestructive evaluation

Research team

Professors, Faculty, Doctorate Holders:

- Alfredo de Blas del Hoyo
- Javier Dies Llovera
- Francesc Puig Adamuz
- Carlos Tapia Fernández
- Javier Abal

Doctoral Candidates:

- Enric Bargalló
- Alex Martin
- Ismael Martinez
- Manuel Martinez
- Jose C. Rivas

Others:

Contact

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POLQUITEX

Research Centre/Group

Name: Materiales Poliméricos y Química Tèxtil
Acronym: POLQUITEX
Web: <http://www.eq.upc.edu/investigacion/polquitex>

General description of the activity (max 200 words)

POLQUITEX is a UPC research group mainly focused on Polymeric Materials and Textile Chemistry investigation and development but some members of POLQUITEX do research in the energy field. Concretely, we do research concerning fast in-situ hydrogen production and clean energy generation from water in basic media using aluminum under safe and mild condition (AlHidroX patented process). This research line has been originated in the Chemical Department of Universitat Autònoma de Barcelona and there is a current collaboration between AlHidroX developers and POLQUITEX.

Our group also investigates on new systems for CO₂ reversible absorption/desorption in inexpensive and non-toxic aqueous inorganic media.

New research lines regarding molten salts for energy applications are also being considered nowadays for their future development.

Specific areas of research in energy field (max 200 words)

Hydrogen production from water.
CO₂ absorption/desorption cycles.
Polymeric membranes for Fuel Cells
Molten salts energy storage

Key words (max 15 items)

Hydrogen, Water, Fuel cells, Aluminum, AlHidroX, CO₂, Absorption, Desorption, Alkaline Polyelectrolytes, Nanocatalyst, Nanoparticles, Membranes, Composites, Molten salts

Research team

Professors, Faculty, Doctorate Holders:

Dr. Jorge Macanás (UPC)
Dr. Maria Muñoz (UAB)
Dr. Juan Casado (UAB)
Dr. Lluís Soler (UAB)

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PROMALS

Research Centre/Group

Name: Research Group in Mathematical Programming, Logistics and Simulation

Acronym: PROMALS

Web:

General description of the activity (max 200 words)

The common objective of our research is the design and implementation of efficient Mathematical Programming and/or Simulation models and methods for decision making in various logistic systems, mainly in those related to transportation planning and management, vehicle routing and service location.

Specific areas of research in energy field (max 200 words)

Currently our main objectives are the study of dynamic fleet management problems by means of integrating optimization and simulation models, the estimation of origin/destination matrices in transportation networks and the analysis of the influence of the facilities location in the design of the distribution routes.

Key words (max 15 items)

- Transportation planning
- Macroscopic, mesoscopic and microscopic traffic modeling
- Vehicle routing
- City Logistics
- Data collection by ICTS sensors and its use in traffic modeling

Research team

Professors, Faculty, Doctorate Holders: Jaume Barceló, Elena Fernández, Esteve Codina, Lúdia Montero, Maria Albareda

Doctoral Candidates: M Paz Linares

Others:

Contact

- Fernández Aréizaga, Elena

PSG

Research Centre/Group

Name: Power Systems Group

Acronym: PSG

Web:

General description of the activity (max 200 words)

Básicamente todo lo relacionado con el análisis de sistemas de generación, transporte y distribución de energía eléctrica, con especial énfasis en los temas de modelación y simulación de procesos transitorios.

Specific areas of research in energy field (max 200 words)

Electric Power Systems: Analysis, Design and Operation

Key words (max 15 items)

- Electric Power Systems
- Distributed Energy Resources
- Transmission and Distribution
- Power Quality
- Smart Grids
- Transient Analysis of Power Systems
- Steady State Analysis of Power Systems
- Insulation Coordination

Research team

Professors, Faculty, Doctorate Holders: Juan A. Martínez Velasco

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SARTI

Research Centre/Group

Name: Remote Acquisition and Data Processing Systems

Acronym: SARTI

Web: <http://sites2.upc.edu/~www-sarti/web/index.php>

General description of the activity (max 200 words)

The SARTI group is built up of a multi-field staff including researchers of different departments of Technical University of Catalonia (UPC). It is an associated unit of Jaume Almera institute, Marine Science institute and Marine Technology unit of Scientific Research Council (CSIC).

SARTI's main field of action is in the instrumentation and environmental sensor development for industrial and scientific applications including digital signal processing, acquisition system electronic design and complex measurement system automation.

It is situated in the Vilanova i la Geltru Technological Center within the UPC campus in Vilanova.

Specific areas of research in energy field (max 200 words)

Integration and design of electronic acquisition systems for monitoring the energy consumption and evaluate the energy management and efficiency. Current applications include: the monitoring of fishing trawler vessels; environmental systems dynamics; metrology; distributed sensors; and system control

Key words (max 15 items)

- System Control
- Virtual Instrumentation
- Integration and design of electronic acquisitions systems,
- Oceanographic Instrumentation,
- Intelligent sensors,
- Signal Processing
- Metrology

Research team

Professors, Faculty, Doctorate Holders:

PhD. Antoni Mànuel Làzaro. Director

PhD. Erik Molino. Projects Coordinator & Researcher

PhD. Spartacus Gomàriz Castro. Resercher

PhD. Shahram Shariat-Panahi. Scientific Coordinator. OBS Project Manager

Doctoral Candidates:

Joaquín del Río. Project manager

David Sarrià. Hardware technician. NORIT project manager.

Daniel Toma. Hardware technician.

Others:

Josep Santamaria. Project Management

Javier Cadena. Hardware technician, Maintenance manager, buying manager

Marc Nogueras Cervera. OBSEA Project Manager

Alberto Hidalgo. Computing Projects manager

Neus Vidal Oliveras, Training Manager

Carla Artero, OBSEA project technician.

Contact

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- Erik Molino. Coordinator. molino@eel.upc.edu

SEER

Research Centre/Group

Name: Sistemes Elèctrics d'Energia Renovable / Renewable Electrical Energy Systems

Acronym: SEER

Web: <http://seer.upc.edu>

General description of the activity (max 200 words)

The objective of REES is to conduct leading edge research at internationally excellent level in the fields of distributed electric power systems by making an intensive use of power processing and conditioning systems based on power electronics.

Specific areas of research in energy field (max 200 words)

In cooperation with both industry and research institutions, REES carries out research in all competence fields of the electrical renewable energy systems, combining experts on renewable energies, power electronics, power systems, control and information technologies in multi-disciplinary research programmes.

Key words (max 15 items)

- Photovoltaics
- Wind energy
- Renewable energy
- Distributed generation
- Smart grids
- Microgrids
- Energy storage
- Power converters
- Power electronics
- Off-shore wind power plants
- High-concentration PV power plants
- Communication and information technologies

Research team

Professors, Faculty, Doctorate Holders: 8

Doctoral Candidates: 12

Others: 3

Contact

SEER

Sistemes Elèctrics d'Energia Renovable
(Renewable Electrical Energy Systems)

Technical University of Catalonia. BarcelonaTech

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SETRI

Research Centre/Group

Name: Grup de Tècniques de Separació i Tractament de Residus Industrials

Acronym: SETRI

Web: <http://www.eq.upc.edu/recerca/setri>

General description of the activity (max 200 words)

SETRI group is involved in the development of scientific bases of waste management. Its studies are focused on the spent nuclear fuel behaviour under repository conditions as well as on the chemistry of actinides and fission products. Models are also being developed to predict radionuclide release proceeding from the interactions between spent fuel and groundwater.

The group also investigates reactive transport of pollutants in geological systems. Understanding the mineral-water interface is the main objective of these studies. Experimental techniques such as X-Ray Photoelectron Spectroscopy, X-Ray Absorption Spectroscopies (EXAFS, XANES), Scanning Electron Microscopy as well as powerful reactive transport models are used to characterize and understand the interactions between mineral surfaces and pollutants.

Another research line is the applications of nano- and meso-structured media in advanced water treatments and development of fundamental approaches to the theoretical and experimental studies of transfer phenomena in such media.

Specific areas of research in energy field (max 200 words)

Key words (max 15 items)

- electrokinetic energy conversion
- salinity-gradient power
- pressure-retarded osmosis
- reversed electrodialysis
- energy-efficient production of ultra-pure water
- energy-efficient separation of stable isotopes

Research team

Professors, Faculty, Doctorate Holders: J.de Pablo, J.L.Cortina, A.Yaroshchuk, A.Florido

Doctoral Candidates: N.Pagès, S.Casas, E.Licón

Others:

Contact

- A.Yaroshchuk, ICREA Research Professor, +34 934054443, andriy.yaroshchuk@upc.edu

SPCOM

Research Centre/Group

Name: Signal Processing and Communications Group

Acronym: SPCOM

Web: <http://gps-tsc4.upc.es/>

General description of the activity (max 200 words)

The SPCOM group research objectives include development of theoretical tools, algorithmic design, and testbed evaluation, combining disciplines such as Information Theory, Signal Processing and Network Theory with the aim of advancing the state of the art in personal, mobile and satellite communication and sensor networks.

Specific areas of research in energy field (max 200 words)

Distributed Energy Generation and Storage Optimization for the Smart Grid

Key words (max 15 items)

- Smart Grid
- Demand Side Management
- Distributed Energy Sources
- Distributed Energy Storage.
- Optimization based in Game Theory

Research team

Professors, Faculty, Doctorate Holders: Prof. Javier Rodríguez Fonollosa and Dr. Luis García Ordóñez.

Doctoral Candidates: Italo Atzeni

Contact

- Javier Rodríguez Fonollosa, javier.fonollosa@upc.edu

SUMM Lab

Research Centre/Group

Name: Sustainability Measurement and Modeling Lab.

Acronym: SUMM Lab

Web: <https://sites.google.com/site/summlab/>

General description of the activity (max 200 words)

The Sustainability Measurement and Modeling Lab is a multidisciplinary research group involved in measuring and modeling the many facets of the sustainability science. The SUMM Lab wants to advance in the comprehension of the complexity of interactions of ecological and social systems, generate knowledge for developing and applying integrative techniques to sustainably manage, govern and understand our world by means of inter- and trans-disciplinary research and technology transfer and promote integrative scientific communication and multidisciplinary encounters to develop the sustainability paradigm and science.

Specific areas of research in energy field (max 200 words)

Energy infrastructures analysis and optimization.

Urban and peri-urban systems analysis and management (energy, material and information networks).

Local and regional sustainability analysis and management.

Key words (max 15 items)

- sustainability
- complex networks
- agent based modeling
- energy infrastructures
- renewable energy

Research team

Professors, Faculty, Doctorate Holders: (see <https://sites.google.com/site/summlab/members>)

Doctoral Candidates:

Others: (see <https://sites.google.com/site/summlab/projects> for research projects and partners)

Contact

- Martí Rosas-Casals, Escola d'Enginyeria de Terrassa, 1, Colom st., 08222 Terrassa, Barcelona (Spain) (rosas @] mmt.upc.edu)

TE

Research Centre/Group

Name: Research Group on Structural Technology

Acronym: TE

Web: <http://eprints.upc.edu/producciocientifica/grup/176487>

General description of the activity (max 200 words)

Study of the behavior, analysis, design and assessment of reinforced/prestressed concrete and steel structures by using numerical modeling and experimental validation. Expertise in: construction materials mechanics, technology and durability; Historical constructions, Precast concrete structures and bridges, steel fiber reinforced concrete, segmental construction of structures and tunnels, reliability and seismic assessment and design of structures and bridges.

All these activities are supported by the LTE Laboratori de Tecnologia d'Estructures.

Specific areas of research in energy field (max 200 words)

Analysis and design of precast posttensioned of tall wind towers for high power wind generators, including experimental validation through instrumentation and comparison with theoretical predictions.

Key words (max 15 items)

- Wind Energy
- Concrete towers
- Structural analysis
- Advanced civil engineering materials
- Foundations
- Floating structures
- Off shore

Research team

Professors, Faculty, Doctorate Holders: Antonio Marí, Climent Molins, Jesús Bairán, Eva Oller
Doctoral Candidates: Several

Contact

- Antonio Marí Bernat
- Climent Molins Borrell

TIEG

Research Centre/Group

Name: Josep Balcells
Acronym: TIEG, Depart. Enginyeria Electrònica
Web: www.tieg.upc.edu

General description of the activity (max 200 words)

The group has developed several projects in the following areas:

- EMC related with Power Converters
- Diagnostic and filtering of mains disturbances.
- Electric Drives design and control.
- Advanced techniques in power electronics: Special converters, Multi-level, Matrix Converters, Sensorless Techniques
- PLC communications

Specific areas of research in energy field (max 200 words)

- Power Converters
- Control systems based on DSP
- Applications for renewable and distributed supply systems.
- EMC modelling and testing: HF and mains measuring systems.
- Diagnostic and filtering of mains disturbances.
- Electric Drives design and control.
- Advanced techniques in power electronics: Special converters, Multi-level, Matrix Converters, Sensorless Techniques
- Power supply design
- PLC communications
- Control of MV distribution systems

Key words (max 15 items)

- EMC
- Converters
- PLC
- Multilevel
- Matrix

Research team

Professors, Faculty, Doctorate Holders: 9
Doctoral Candidates: 4
Others: 4

Contact

- Josep Balcells. josep.balcells@upc.edu

TRANSMAR

Research Centre/Group

Name: TRANSMAR
Acronym: TRANSMAR
Web: <http://www.dcen.upc.edu/>

General description of the activity (max 200 words)

TRANSMAR is engaged in viability study of marine transport chains, compared with the road alternative. It is involved in exploring new tools and areas, to promote sea transport from different points of view like the operational, legal and economical, sides.

Specific areas of research in energy field (max 200 words)

Sustainability of maritime transport is the most important topic carried out by TRANSMAR. More than 90% of international trade is sent by sea, so the sea and air pollution avoidance is our goal.

Key words (max 15 items)

- Maritime transport
- Port logistics
- Short sea shipping

Research team

Professors, Faculty, Doctorate Holders: Ricard, Rodríguez-Martos Dauer
Ricard Marí Sagarra
F. Xavier Martínez de Osés
Víctor García Carcellé
José Manuel de la Puente,
Marcel.la Castells Sanabra,
Jaume Recolons Martos:
Jaime Rodrigo de Larrucea
Doctoral Candidates: Juan José Usabiaga Santamaría

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