IOC

Institute of Industrial and Control Engineering

Activities Report 2022-2023

UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
UPC
Institute of Industrial and Control Engineering

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1. Organisational structure and governing bodies

Management

Director	ROBERT GRIÑÓ CUBERO
Assistant director	ANTONIN SEBASTIEN PONSICH
Secretary	BRUNO DOMÈNECH LEGA
Technical and Management Support Area - UTGAEIB	M. LOURDES DURANY VIDAL

The Board

Director	ROBERT GRIÑÓ CUBERO
Assistant director	ANTONIN SEBASTIEN PONSICH
Secretary	BRUNO DOMÈNECH LEGA from
Representative of the **Control** division	OLM MIRAS JOSEP M.
Representative of the **Design and Optimisation of Processes and Services (DOPS)** division	LAIA FERRER MARTÍ
Representative of the **Robotics** division	RAÚL SUÁREZ FEIJÓO
Technical and Management Support Area - UTGAEIB	M. LOURDES DURANY VIDAL
Representative of teaching and research staff who hold a PhD	JAN ROSELL GRATACÒS
Representative of administrative and service staff	LEOPOLD PALOMO AVELLANEDA

The Council

Alfaro Pozo, Rocío	from 01/11/2022
Arias Pujol, Antoni	
Batlle Arnau, Carles	
Bautista Valhondo, Joaquin	
Biel Solé, Domingo	
Calleja Sanz, Gema	
Casanovas Rubio, Mar	
Domenech Lega, Bruno	Secretary
Dòria Cerezo, Arnau	
Durany Vidal, Ma Lourdes	Technical and Management Support Area UTGAEIB
Ferrer Llop, Josep	
Ferrer Martí, Laia	
Fossas Colet, Enric	
García Villoria, Alberto	
Griñó Cubero, Robert	Director
Hatami, Sara	from 01/11/2022
Juanpera Gallel, Marc	
Lusa Garcia, Amaia	
Mas Casals, Orestes	
Mateo Doll, Manel	
Olivella Nadal, Jordi	
Olm Miras, Josep Maria	
Palomo Avellaneda, Leopold	Representative of administrative and service staff
Panadero Martínez, Javier	from 01/11/2022 until 31.08.23
Pastor Moreno, Rafael	
Peña Carrera, Marta	
Peña Pitarch, Esteban	
Ponsich, Antonin Sebastien	Assistant director
Repecho del Corral, Víctor	
Roig Fernández, Vicenç	
Rosell Gratacòs, Jan	

Suárez Feijóo, Raúl	Representative of the Robotics division
Zaplana Agut, Isiah	

2. Staff

GLOSSARY

DIVISIONS/SERVICE	CTL	Division of Automatic Control
	DOPS	Division Design and Optimisation of Processes and Services
	ROB	Division of Robotics
CATEGORY	AG/TU	Associate professor
	LT	Assistant professor
	BR	Research grantholder
	CU	Professor
	DI	Research supervisor
	PAS LAB	Technical staff

NAME		DIVISIONS/ SERVICE	CATEGORIES
Alfaro Pozo	Rocío	ROB	LT
Arias Pujol	Antoni	CTL	TU
Batlle Arnau	Carles	CTL	TU
Bautista Valhondo	Joaquin	ROB	CU
Biel Solé	Domingo	CTL	TU
Calleja Sanz	Gema	DOPS	LT
Casanovas Rubio	Mar	DOPS	LT
Cardoner Parpal	Rafel	SSR	PAS LAB.
Domènech Lega	Bruno	DOPS	AG

NAME		DIVISIONS/ SERVICE	CATEGORIES
Dòria Cerezo	Arnau	CTL	AG
Ferrer Llop	Josep	CTL	CU
Ferrer Martí	Laia	DOPS	CU
Figuerola Gil	Pol	DOPS	BR
Fossas Colet	Enric	CTL	CU
García Villoria	Alberto	DOPS	AG
Griñó Cubero	Robert	CTL	TU
Hatami	Sara	DOPS	LT
Juanpera Gallel	Marc	DOPS	BR
Leduchowicz Municio	Alba	DOPS	BR
Luciano	Ludovica	CONTROL	BR
Lusa García	Amaia	DOPS	CU
Mas Casals	Orestes	ROB	TU
Mateo Doll	Manuel	DOPS	TU
Miró Valero	Enric	SSR	PAS LAB.
Olivella Nadal	Jordi	DOPS	TU
Olm Miras	Josep M.	CTL	AG
Palomo Avellaneda	Leopold	SSR	PAS LAB.
Panadero Martínez	Javier	DOPS	AG
Pastor Moreno	Rafael	DOPS	CU

NAME		DIVISIONS/ SERVICE	CATEGORIES
Peña	Marta	DOPS	AG
Peña Pitarch	Esteban	ROB	TU
Ponsich	Antonin Sebastien	DOPS	LT
Rahimi	Leyla	CONTROL	BR
Repecho Del Corral	Victor	CTL	LT
Rosell Gratacòs	Jan	ROB	TU
Ruiz Celada	Oriol	ROB	BR
Sadjadi	Ebrahim	ROB	BR
Sheikhsamad	Mohamad	ROB	BR
Shirzadi Maryan	Morad	ROB	BR
Suárez Feijóo	Raúl	ROB	DI
Urbaniak	Dominik	ROB	BR
Zaplana Agut	Isiah	ROB	LT

PhD Students

NAME		DIVISIONS/ SERVICE
Aguilar Gamarra	Harry Nick	DOPS
Alaeddin	Mojtaba	CONTROL
Codina Torras	Eloi	DOPS
Romero Sepúlveda	Arnau	ROB
Urra González	Fernando	ROB

Visiting Staff

NAME	DIVISIONS	UNIVERSITY
Nadia Postorino	DOPS	University of Bologna
Pietro De Lellis	DOPS	Università degli Studi di Napoli Federico II
Jose Angel Acosta	CONTROL	Universidad de Sevilla
Francisco Gil Montoya	ROB	Universidad de Almeria
Alfredo Alcayde Garcia	ROB	Universidad de Almeria
Marcin Koniak	CONTROL	Warsaw University of Technology
Federico Serra	CONTROL	Universidad Nacional de San Luis

Incoming Students

NAME	DIVISIONS	UNIVERSITY
Andres Alberto Castro	ROB	Escuela Superior Politécnica del Litoral (ESPOL)
Martín Sebastian Aguilar Zambrano	ROB	Escuela Superior Politécnica del Litoral (ESPOL)
Diego Sebastian Ronquillo Manosalvas	ROB	Escuela Superior Politécnica del Litoral (ESPOL)
Ariel Enrique Dume Gómez	ROB	Escuela Superior Politécnica del Litoral (ESPOL)
Francesco De Astis	CONTROL	Politecnico di Torino
Abdullah Coşgun	ROB	Eindhoven University of Technology
Timothée Dessagne	ROB	École Nationale Supérieure d'Electroniq et de ses Applications (ENSEA)
Roberto Aratri	CONTROL	Politecnico di Bari
Claudia Lorena Sanchez Solis	DOPS	Université de Liège

3. Divisions

Research at the IOC is conducted through three divisions:

Division of Automatic Control

The main projects in this division are set in the following thematic areas: Control Theory, Energy Systems and Automotive Applications.

Head: JOSEP M. OLM MIRAS

Research fields:

- Advanced linear controllers (Resonant and repetitive control).
- Nonlinear control techniques (Passivity-based control, Adaptive control, Sliding mode control).
- Complex dynamical networks.
- Modelling and control of electronic power systems (generation and conversion).
- Control algorithms for an overall improvement of the vehicle performance.
- Autonomous and cooperative driving applications.

Division of Design and Optimisation of Processes and Services

The Division of Design and Optimisation of Processes and Services covers the design and management of the supply chain, namely production and logistic Systems to generate goods and services, as well as the necessary techniques for solving efficiently its derived problems.

Head: LAIA FERRER MARTI

The division of Design and Optimisation of Processes and Services specializes in developing optimization models and decision-making support tools for supply chain design (production, distribution, recovery and remanufacturing or recycling). The aim of the group is to contribute to the improvement of the efficiency and sustainability, economic and environmental, of the organizations. The group's research has a highly applied approach to ensure that the results are directly applicable and easily transferable to productive and service organizations.

Fields of activity
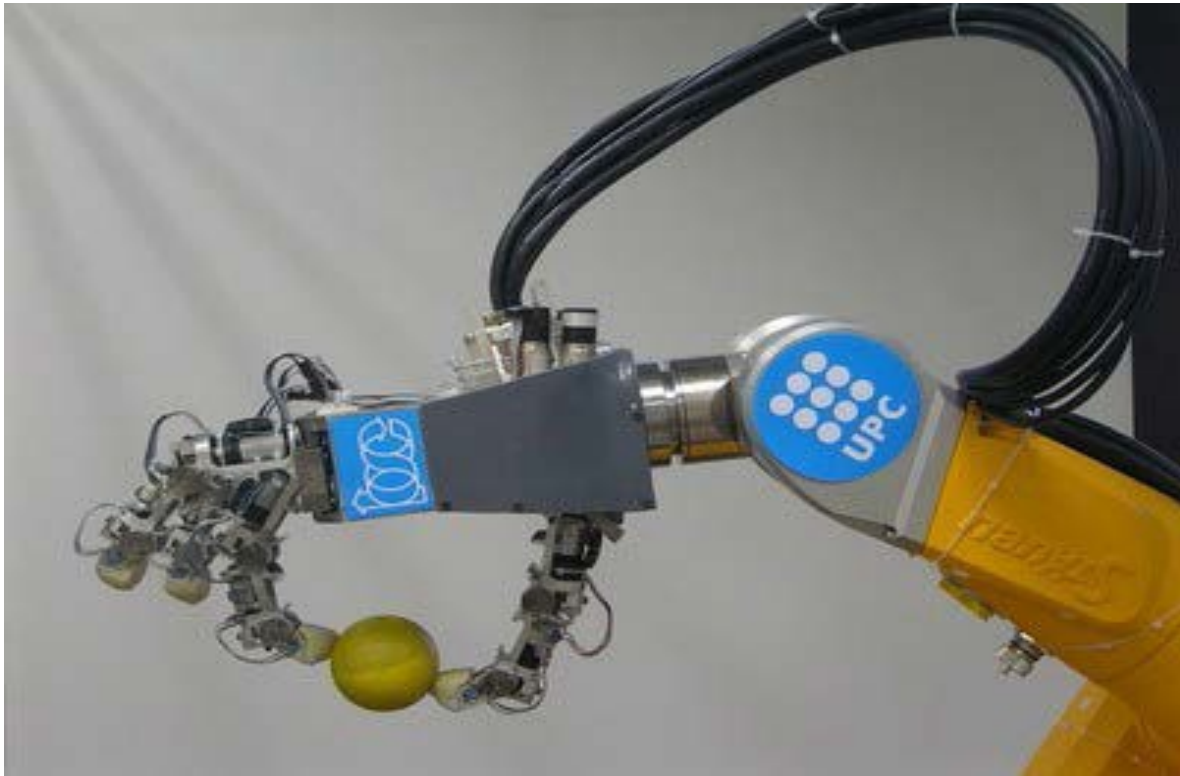Industry 4.0 in the field of the supply chain
Operations management
Urban distribution and mobility
Energy planning with renewable energies
Healthcare logistics
Circular and social economy

Division of Robotics

The Division of Robotics of the IOC deals with basic and applied research on different aspects of robotics, either considering the robot as a single machine or integrated with other elements and devices within a robotized system. The research extends to different application fields in both the industrial and service areas.

Head: RAÚL SUÁREZ FEIJÓO

Main fields of activity

- Task and motion planning
- Grasping and dexterous manipulation
- Mobile manipulators
- Robot co-workers
- Human-robot interaction
- Teleoperation and haptic systems
- Control and programming of robots
- Perception systems and sensor integration
- Computer vision
- Simulation of robotized systems
- Industrial applications of robotics
- Service robots

4. Facilities

The IOC is located on the 11th floor of building H of the Barcelona School of Industrial Engineering (ETSEIB).

The Institute has two robotics laboratories; a control and electronics laboratory; a logistics laboratory; a computer network equipped with servers, workstations, PCs; a WiFi network; a specialised library with around 6,000 books and numerous journals; a classroom that can hold 25 people; and a meeting room with videoconferences equipment, a digital blackboard and a projector with a capacity for 10 people.

Equipping research laboratories

Robotics Laboratories
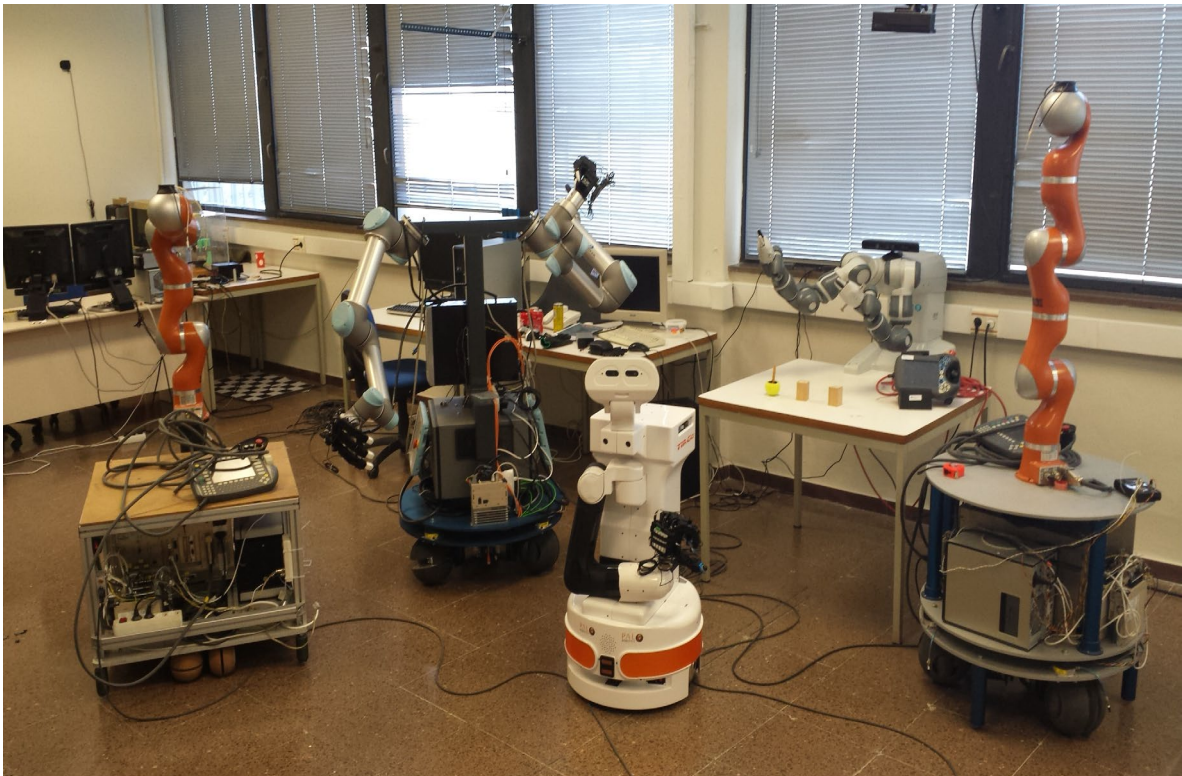
- 2 Stäubli TX90 robots, one is mounted on a motorized rail.
- 2 Kuka LWR robots with 7 axes, each one mounted on a mobile platform (BMM1 and BMM2).
- 1 Pal Robotics TIAGo equipped with two arms.
- 1 YuMi ABB robot.
- An omnidirectional mobile dual-arm robot (equipped with two Universal UR5 arms).

- Several grippers and robotic hands: Schunk SAH, Schunk SDH and 3 Allegro hands.
- Haptic devices: Phantom Omni, Phantom Premium 1.5/6DOF and Phantom Premium 1.5/6DOF High force.
- Sensory systems such as video cameras, trackers, force sensors, tactile sensors and 3D cameras.
- A 3D projector with the corresponding glasses.
- Several servers, PCs, monitors.
- 2 virtual reality glasses Oculus Rift.
- 1 Drone DJI Phantom 2 Vision+.
- 1 Drone Parrot AR.Drone 2.0.

Control and Electronics Laboratory
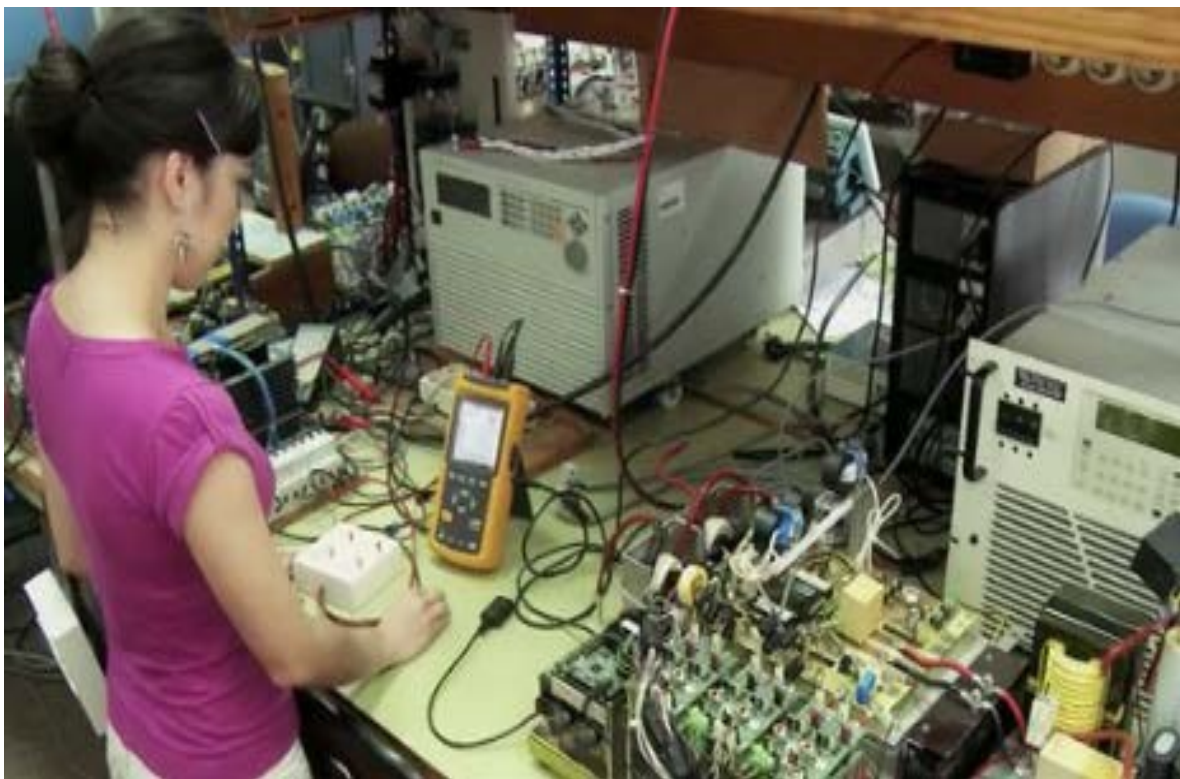
- Oscilloscopes.
- Signal analyzer and signal generators.
- Sources and power loads (e.g. ac and dc power sources, and ac and dc programmable loads).
- Measuring instrumentation (multimeters, differential probes, current probes).
- Emulators for microprocessors and digital signal processors.
- Computers.
- Hardware and software for the design and implementation of electronic circuits.
- Tools and equipment for the realization of small-scale mechanical assemblies.
- Thermographic camera.

DOPS Computing Cluster

The DOPS Computing Cluster is a robust computational infrastructure comprising eleven interconnected units managed by SLURM (Simple Linux Utility for Resource Management), used in High Performance Computers. SLURM efficiently allocates resources and schedules job executions, ensuring optimal performance and equitable resource distribution across the center's units.

➢ **Equipment Configuration:**
- Four nodes with 4GB of RAM each.
- Five nodes with 16GB of RAM each.
- One node with 40 cores (Intel Xeon E5-2630 v4) and 64GB of RAM.
- One node with 128 cores (AMD EPYC 7543) and 256GB of RAM.

➢ **Additional Features:**
- Parallel Processing with OpenMP:/ Users can harness OpenMP for parallel processing, leveraging multicore architectures for efficient computation.
- Optimization with Docplex:/ The center supports Docplex, facilitating the resolution of complex optimization problems through mathematical programming.
- Python Virtual Environments (venv):/ Users can create and manage virtual environments within the Python environment (venv), ensuring isolation, compatibility and reproducibility for specific projects.
- Scheduled job Execution:/ SLURM enables users to schedule job executions at predetermined times, streamlining workflow processes and optimizing resource utilization.
- Customizable resources allocation:/ Users can specify the maximum RAM, CPU's size for their jobs, preventing resource contention and maximizing efficiency.
- Reproducibility and metrics:/ Users can run a program in a controlled environment to accurately measure its performance and execution time in a consistent manner. This helps avoid interferences and workload fluctuations, ensuring reliable measurements of the program under standardized CPU and memory conditions.

5. University masters

Master's Degree in Automatic Control and Robotics

The Master's degree in Automatic Control and Robotics is an official degree adapted to European Higher Education Area (EHEA) offered by the Technical University of Catalonia (UPC) since the academic course 2006-07. The Masters is promoted by the Department of Systems Engineering, Automation and Industrial Informatics (ESAII) and the Institute for Systems and Control Engineering (IOC). It is a research oriented master in the area of Automatic Control and Robotics.

The Institute of Industrial and Control Engineering (IOC) was set up for the purposes of conducting research and training researchers to a high level of specialisation. It is actively involved in teaching master and doctoral degrees.

6. Doctoral degrees

Doctoral programme in Automatic Control, Robotics and Computer Vision (ARV)

The Doctoral programme in Automatic Control, Robotics and Computer Vision (ARV) emerged in 2006 from the fusion of the Doctoral programme in Advanced Automation and Robotics of the Institute of Industrial and Control Engineering (IOC) and of the Doctoral programme in Control, Vision and Robotics of the Automatic Control Department (ESAII), both with Quality Mention of the Spanish Ministry of Education (MEC). The fusion was fruit of an increasing thematic affinity and convergence between both programmes, and was carried out taking advantage of the opportunity to adapt the programme to the new syllabus of the Official Postgraduate Programmes in the framework of the European Higher Education Area.

The ARV Doctoral programme achieved from the beginning the Quality Mention, from the academic year 2007-2008 until 2010-2011. Then this award was replaced by the Excellence Mention by the Spanish Ministery of Education, with code MEE2011-0453. This mention was awarded from the academic years 2011-2012 until 2013-2014, and the programme ARV always obtained it.

The units responsible for the program are:

- Automatic Control Department (ESAII)
- Institute of Industrial and Control Engineering (IOC)

Doctoral Committee for the doctoral degree in Automatic Control, Robotics and Computer Vision (ARV)

- Dr. Suárez Feijóo, Raúl (Coordinator PhD ARV until 28.05.23)
- Dr. Vicenç Puig (Coordinator PhD ARV from 29.05.23)
- Dra. Alícia Casals Gelpí
- Dr. Andreu Català Mallofré
- Dr. Robert Griñó Cubero
- Dr. Rafael Pastor Moreno
- Dr. Jan Rosell Gratacòs
- Dr. Alberto Sanfeliu Cortés

Doctoral data 2022-2023

A.	**Program Coordinator**	**RAÚL SUÁREZ FEIJÓO**
B.	**Number of students**	**100** (2022/2023)

Thesis presented during 2022/2023:

Date	18/11/2022
Title	Leak Supervision in Water Distribution Networks based on model-based and data-driven approaches
Author	COSTA DA SILVA ALVES, DEBORA CRISTINA
Thesis Director	BLESA IZQUIERDO,JOAQUIN DUVIELLA, ERIC
Qualification	Excel.lent

Date	17/02/2023
Title	Event based SLAM
Author	CHAMORRO HERNÁNDEZ, WILLIAM OSWALDO
Thesis Director Thesis Codirector	ANDRADE CETTO, JUAN SOLA ORTEGA, JOAN
Qualification	Excel.lent

Date	02/03/2023
Title	Shedding light on sewer pipes: deep learning perception approaches for autonomous sewer robots
Author	PLANA RIUS, FERRAN
Thesis Director	MIRATS TUR, JOSEP MARIA CASAS GUIX, MARC
Qualification	Excel.lent

Date	24/03/2023
Title	Contributions to prognostics and health-aware control of dynamic systems
Author	KHOURY, BOUTROUS
Thesis Director Thesis Codirector	PUIG CAYUELA,VICENÇ NEJJARIAKHI-ELARAB,FATIHA
Qualification	Excel.lent Cum Laude

Date	29/03/2023
Title	Modeling and control of a vanadium redox flow battery
Author	CLEMENTE LEON,ALEJANDRO
Thesis Director Thesis Codirector	COSTA CASTELLO,RAMON
Qualification	Excel.lent Cum Laude

Date	26/05/2023
Title	Detection and diagnosis of faults and damage in wind turbines
Author	PURUNCAJAS MAZA, BRYAN JOAO
Thesis Director Thesis Codirector	VIDAL SEGUI,YOLANDA TUTIVEN GALVEZ,CHRISTIAN
Qualification	Excel.lent

Date	30/05/2023
Title	Visual understanding of human behavior: 3D pose, motion, actions and context
Author	HERNANDEZ RUIZ,ALEJANDRO JOSE
Thesis Director Thesis Codirector	MORENO NOGUER,FRANCESC D'ASSIS
Qualification	Excel.lent Cum Laude

Date	14/06/2023
Title	Characterization of a novel HgCdTe focal plane array for ground and space astronomy through innovative infrared setups
Author	JIMENEZ ROJAS, JORGE IVÁN
Thesis Director Thesis Codirector	GRAU SALDES, ANTONI PADILLA ARANDA,CRISTÓBAL
Qualification	Excel.lent Cum Laude

Date	04/09/2023
Title	Safety and adaptation in physical interaction control for robotic applications
Author	SAN MIGUEL TELLO,ALBERTO
Thesis Director Thesis Codirector	PUIG CAYUELA,VICENÇ ALENYA RIBAS,GUILLEM
Qualification	Excel.lent Cum Laude

Date	28/09/2023
Title	LPV Lateral Control of Autonomous and Automated Vehicles
Author	MEDERO BORRELL, ARIEL
Thesis Director Thesis Codirector	PUIG CAYUELA,VICENç SENAME, OLIVIER
Qualification	Excel.lent Cum Laude

Date	29/09/2023
Title	Crutch gait patterns characterization through spatial and temporal parameters
Author	NARVAEZ DORADO, MARIEN CRISTINA
Thesis Director Thesis Codirector	ARANDA LOPEZ, JUAN
Qualification	Excel.lent

Date	31/10/2023
Title	Optimización de recursos intralogísticos en entornos industriales para su uso en vehículos autónomos
Author	VARGAS MARTIN, ELLIOT
Thesis Director Thesis Codirector	VELASCO GARCIA,MANUEL MARTI COLOM, PAU
Qualification	Excel.lent

Date	09/11/2023
Title	AI-enhanced Cyber-Physical Systems in Automotive Industry. Integration of CPS and Application Artificial Intelligence Technologies in Automotive Paint Shop Process.
Author	SANZ GRàCIA, ELVIRA MARIA
Thesis Director Thesis Codirector	PUIG CAYUELA,VICENç BLESA IZQUIERDO,JOAQUIN
Qualification	Excel.lent

Date	16/11/2023
Title	Modeling and Reconstruction of 3D Humans
Author	CORONA PUYANE, ENRIC
Thesis Director Thesis Codirector	ALENYA RIBAS,GUILLEM MORENO NOGUER,FRANCESC D'ASSIS
Qualification	Excel.lent Cum Laude

Date	20/11/2023
Title	Contributions to LPV control under time-varying saturations
Author	RUIZ ROYO, ADRIAN
Thesis Director Thesis Codirector	MORCEGO SEIX,BERNARDO ROTONDO, DAMIANO
Qualification	Excel.lent

Date	30/11/2023
Title	Fault diagnosis in wind turbines using machine learning techniques
Author	PEREZ PEREZ, ESVAN DE JESUS
Thesis Director Thesis Codirector	PUIG CAYUELA,VICENç LOPEZ ESTRADA,FRANCISCO RONAY
Qualification	Notable

Doctoral programme Supply chain and operations management (SCOM)

The aim of the doctoral program SCOM (Supply Chain & Operations Management) is to promote and develop research into the supply chain and thus contribute to improve the economic and environmental efficiency of all kind of organizations.

Currently, the concept of supply chain, which includes and exceeds operations management and logistics, articulates the research on supply, production, distribution and recovery. Although, strictly speaking, the concept of supply chain management includes operations management, the fact of joining them in the name of the PhD program indicates which is the aspect of the SC management in which the program focuses most.

SCOM begins in 2016 with the participation of the academic staff of the Department of Management (OE) and the Institute of Industrial Engineering of Control (IOC) has recognized extensive teaching, research and thesis experience in the monitoring program. Moreover, the participation of these personnel in conferences and research projects and publications in high impact journals, show their own experience of research on the item of SCOM.

Doctoral Committee for the doctoral degree:

- Dr. Manel Mateo Doll (Coordinator PhD SCOM)
- Dr. David Agustin Ripoll
- Dr. Bruno Domenech Lega
- Dr. Laia Ferrer Martí
- Dr. Núria Gongora Mora
- Dr. Amaia Lusa Garcia
- Dr. Rafael Pastor Moreno
- Dr. Imma Ribas Vila

Doctoral data 2022-2023

A.	**Program Coordinator**	**AMAIA LUSA GARCIA**
B.	**Number of students**	**14** (2022/2023)

Thesis presented in 2022-23:

Date	19/06/2023
Title	CADENA DE SUBMINISTRAMENT I DIRECCIO D'OPERACIONS
Author	GALLEGUILLOS POZO, ROSA ELIZABETH
Thesis Director Thesis Directora	DOMENECH LEGA, BRUNO FERRER MARTI, LAIA
Qualification	Excel.lent

Date	15/12/2023
Title	CADENA DE SUBMINISTRAMENT I DIRECCIO D'OPERACIONS
Author	ANDREU CASAS, ENRIC
Thesis Director Thesis Directora	PASTOR MORENO, RAFAEL GARCÍA VILLORIA, ALBERTO
Qualification	Excel.lent Cum Laude

7. Projects and agreements

Public funding projects

Head researcher	CASANOVAS RUBIO, MAR
Title	Empowerment of low-income population for the self-construction of pavements by means of earthen paving: an experience in the Vitória community of the Moviment Sense Sostre in Diamantina (Brazil)
Funding institution	Centre de Cooperació per al Desenvolupament de la UPC
Reference	CCD-2023-A027
Start-up date	01/03/2023
Completion date	30/04/2024

Summary

The aim of the project is to disseminate and support the initial implementation of a sustainable self-construction technique in order to improve the paving of the streets and homes of a low-income neighborhood located in Diamantina, state of Minas Gerais in Brazil. Through the collaboration of the Universitat Federal dos Vales de Jequitinhonha e Mucuri (UFVJM), a small factory for self-production of earth-cement slabs will be built consisting of a roof, floor and installation of equipment for self-production of the tiles. Subsequently, training workshops will be held so that the community can self-produce the tiles and learn how to install them. Initially, an outdoor space of 200 m2 will be paved where community dining rooms are located. Once the training workshops have been carried out, it is intended that the community itself can enjoy the benefits of these facilities for future improvements in the paving of common areas of the neighborhood and their own homes and can even use them to manufacture and sell tiles and generate a small income for the families of the community. Finally, dissemination will be carried out both within and outside the academic world so that this experience can be replicated in other communities.

Head researcher	DÒRIA-CEREZO, ARNAU
Title	GAP_Noise, Global Acoustic interaction and Psychoacoustic impact of the autonomous vehicles in interior and exterior
Funding institution	Commission of European Communities
Reference	HORIZON-101073014-GAP_Noise
Start-up date	01/03/2023
Completion date	28/02/2027

Summary

The goal of this Doctoral Network is to create an interdisciplinary research training network to address the major challenge of sound shaping for safety in electric vehicles. The research program would include research topics such as sound quality and NVH, advanced automatic control, multi-physics modeling, vehicle integration and functional safety, multi-disciplinary co-design, and multi-domain optimization.
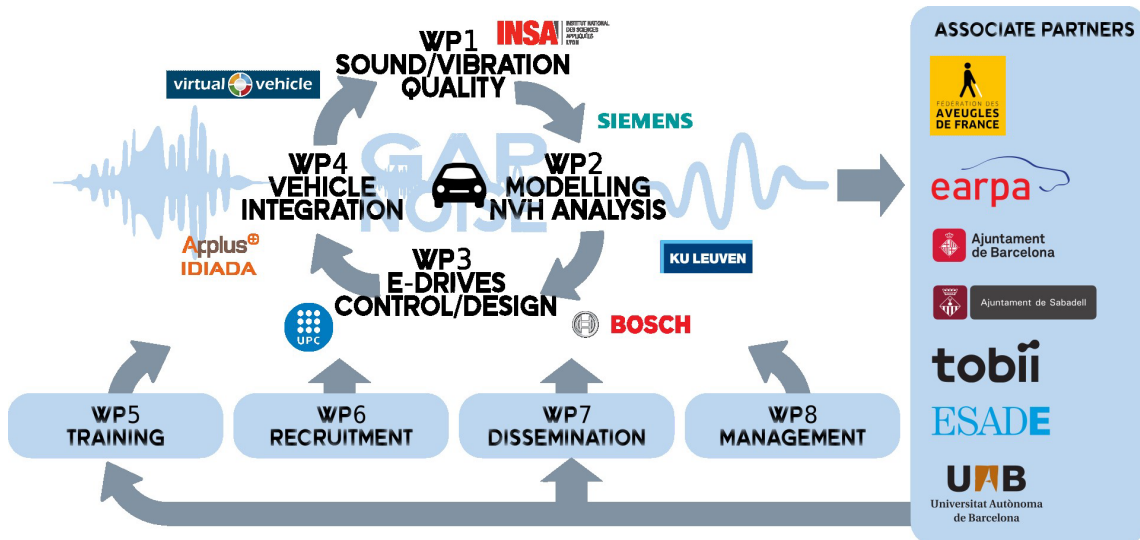
Head researcher	FERRER-MARTÍ, LAIA
Title	Design and optimisation of processes and services
Funding institution	AGAUR. Agència de Gestió d'Ajuts Universitaris i de Recerca
Reference	
Start-up date	01/01/2022
Completion date	31/12/2024

Summary

The group specializes in problems related to the design and management of the supply chain (Supply Chain), including the management of operations in the supply chain, in all types of organizations. The mission of the group is to promote and develop research on the Supply Chain and thus contribute to the improvement of the economic and environmental efficiency of organizations, specifically in the processes of supply, production, distribution, recovery and remanufacturing or recycling.

Head researcher	FERRER MARTÍ, LAIA
Title	Optimisation of Microgrids with Renewable Energies under Uncertainty and Future Grid Integration.
Funding institution	Agencia Estatal de Investigación
Reference	RTI2018-097962-B-I00
Start-up date	01/01/2019
Completion date	30/09/2022

Summary

Microgrids and renewable energy have proven beneficial in increasing access to electricity, to reduce transmission losses and increase security of supply, among others. In Spain, self-consumption and distributed generation with smart micro-grids (smart grid) is significantly increasing and, as a result, costs are reduced for consumers, renewable generation increases and CO_2 emissions are reduced, and it is a new business model and a source of job creation.

The optimization of the detailed design of these microgrids is a very complex combinatorial problem given the huge amount of alternatives for locating equipment, distribution structures considering microgrids isolated or connected (initially or in the future) to the main grid with purchase-sale of energy, considering uncertainty in the generation and demand data, and the multicriteria nature inherent to the system. In this context, the general objective of this proposal, OMER-IFIR, is to optimize the design and management of micro-grids with renewable energy as well as technical, economic, social, environmental and management constraints and criteria.

Head researcher	GRIÑÓ CUBERO, ROBERT- DÒRIA-CEREZO, ARNAU
Title	ACoCSI, Advanced control of single-phase and three-phase Current Source Inverters (CSI)
Funding institution	AGENCIA ESTATAL DE INVESTIGACION
Reference	PID2021-122821NB-I00
Start-up date	01/09/2022
Completion date	31/08/2026

Summary

The ACoCSI project aims to contribute to new control algorithms to improve the performance of the new generation of CSIs. The project will test CSIs in two different applications: the control of a permanent-magnet synchronous motor (PMSM) and PV power conversion systems. During the project, five different CSIs will be assembled: a drive for a PMSM to be
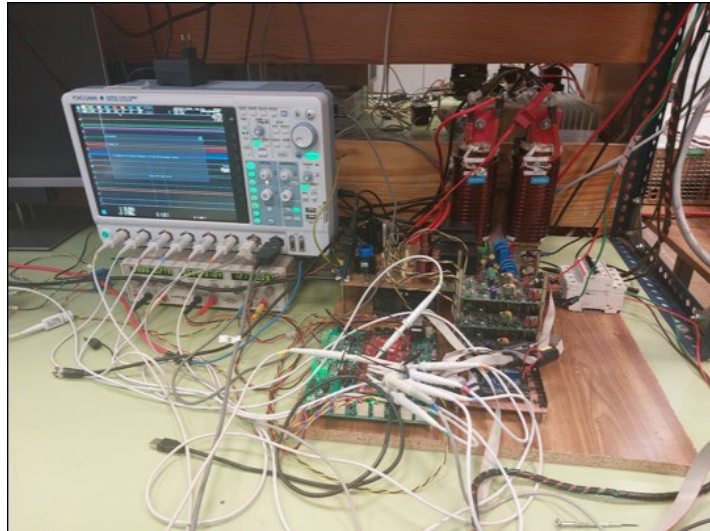
tested with the electrical motors in the laboratory and single- and three-phase CSIs for PV applications for both isolated and grid-connected operation. To increase the performance of the power conversion, the project ACoCSI will adapt, according to the requirements of each application, advanced techniques for the design of controllers. The expected control advances along the project are not limited to CSIs, but they can also be useful for other converter topologies.

Head researcher	GRIÑÓ CUBERO, ROBERT
Title Advanced Control and Power Electronics (ACaPE)	
Funding institution	AGAUR. Agència de Gestió d'Ajuts Universitaris i de Recerca
Reference	2021 SGR 00376
Start-up date	01/01/2022
Completion date	31/12/2024

Summary

ACaPE is a research group with a long experience in the analysis, design and implementation of advanced control systems, with special emphasis on power electronic converters. The group's research focuses on the modelling and control of complex systems, and their application to problems related to the generation, conditioning, management and storage of electrical energy. New multilevel conversion techniques and modulation and control algorithms are also used to improve the performance of conventional renewable energy systems such as photovoltaic systems, wind power systems and electric and hybrid vehicles.
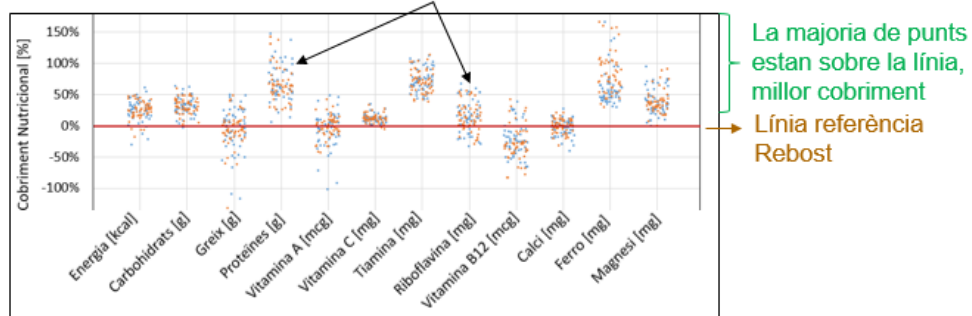
Head researcher	JUANPERA GALLEL, MARC
Title Optimising the social distribution of food: improving the nutrition of people in vulnerable situations.	
Funding institution	Centre de Cooperació per al Desenvolupament de la UPC
Reference	CCD2023-B003
Start-up date	01/06/2023
Completion date	31/05/2025

Summary

According to the latest data from the United Nations, in 2021, it is estimated that 768 million people suffered from food insecurity worldwide. This problem mainly affects developing countries, but the numbers in countries of the global north are also becoming very relevant. This project aims to develop quantitative tools, based on mathematical models, to optimize the social distribution of food and improve the nutrition of vulnerable people. Efforts will focus on three levels. On a local level, the composition of the baskets distributed to families will be optimised, taking into account individual needs. On a state level, the food distribution from food banks to distribution centers will be optimized. On an international level, we will work together with the World Food Program to define a multi-criteria procedure to select the most appropriate intervention that a country like Nigeria can do to improve the nutrition of certain vulnerable groups, such as children, pregnant and lactating women or elderly people.

Solució de la composició de les cistelles.
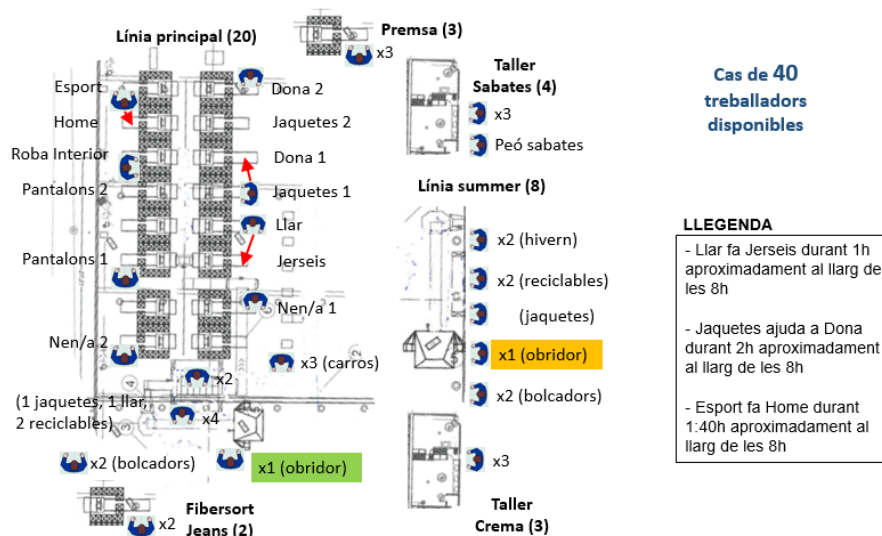Millora del cobriment nutricional actual del Rebost

Head researcher	JUANPERA GALLEL, MARC
Title	Decision-making aids for organisations in the context of the circular and social economy
Funding institution	Centre de Cooperació per al Desenvolupament de la UPC
Reference	CCD-2022-C001
Start-up date	01/06/2022
Completion date	31/05/2023

Summary

The situation of natural resources calls for a change in the linear model of production-consumption-waste towards circular models that encourage the reuse of products. In addition, the still precarious employment situation leaves many people at risk of social exclusion. In this context, there are third-sector entities committed to reducing inequalities and using more sustainable production-consumption models, such as Formació i Treball, which promotes the employment of people at risk of exclusion through the collection, processing and redistribution of second-hand clothes; and El Rebost de Terrassa, aimed at the distribution of food among vulnerable populations. This project aims to continue the work begun last year to provide these and other entities with tools to optimize their processes. Specifically, among other projects, the aim is to optimize the balance of clothing processing lines according to the particular conditions of the workers in insertion (training itineraries, absenteeism), and to balance the weekly and urgent supply of food to vulnerable populations. It is planned to extend the tools developed to other entities with similar models.

Assignació de treballadors a les estacions de treball de Formació i Treball

Head researcher	OLIVELLA NADAL, JORDI
Title	Capacity Building in Higher Education ERASMUS+ project, Modernising Digital Education in Energy Transition for Circular Economy in Latin America. ERASMUS-EDU-2022-CBHE-STRAND-2 (101081473).
Funding institution	Commission of European Communities
Reference	EU-BEGP ERASMUS-EDU-2022-CBHE-STRAND-2
Start-up date	15/02/2023
Completion date	14/02/2026

Summary

In the EU-BEGP project nine universities in Latin America (Bolivia, Ecuador, Guatemala, Peru) will collaborate with two universities in EU (France, Spain) towards modernisation of courses and programs in the energy sector, with emphasis upon circular economy towards energy sustainability. The collaboration is inspired by two earlier successful

Erasmus+ CBHE projects. It will re-use both the framework and learning material developed from these projects while developing and implementing specific new courses and programs adapted for the local conditions in the partner countries. More specifically it will significantly enhance capacity building on an educator-to-educator basis towards a significant modernisation of energy curriculum in the partner countries. The project will contribute on the paradigm shift towards global-but-local student-centred education in a digital and online learning environment.

The EU-BGEP project will allow collaborative creation of learning material to create/update programs and courses, which includes a baseline of 3 Master programs, 1 "Diplomado" program, 3 expert courses, 15 courses, and 7 short courses, with more than 1000 expected students to be trained at the end of the project in all the partner countries. Furthermore, 10 remote labs will be implemented, enabling real experimental experience to students in remote areas, and 10 entrepreneurial challenges will be run in collaboration with local industries, thus contributing to the employability of young professionals. A specific Quality Improvement Process, with transnational and global peer review, will be implemented throughout all the learning resources, ranging from individual modules through courses and full programs. A significant strength of the EU-BEGP project is that it is part of an intended global collaboration of online

digital learning resources, courses, and programs in the energy sector (the "EXPLORE Energy Digital Academy").

All material developed will be included in this framework and the EU-BEGP consortium will have full access to all the already existing, and to be developed, high-quality material. Such global collaboration takes this Erasmus+ CBHE project to a higher level by projects building upon each other, strongly increasing the impact far beyond what an isolated CBHE project would reach.

Head researcher	OLIVELLA NADAL, JORDI
Title	Teaching case studies on development projects for masters in engineering.
Funding institution	Centre de Cooperació per al Desenvolupament de la
Reference	CCD- 2022-B001
Start-up date	01/06/2022
Completion date	31/05/2023

Summary

The project consists of the preparation of two case studies on development projects for innovation, entrepreneurship and technology management courses. The teachers participating in the proposal are in charge of these types of courses at ETSEIB, EEBE and FNB and we propose to test and implement the cases in these courses. The members of the team have experience in teaching case studies. The cases will consist of development cooperation actions and we will analyze the policies adopted, the implementation and the results. The cases will reflect the identification of alternatives and the adoption of difficult decisions in a complex environment and will be based on situations in Bolivia and Brazil, from the contacts we have in these countries and their interest from the development point of view. The cases must be prepared based on real, clearly identified and recent events. The cases will consist of audiovisual material, detailed information and activities that can be done both in person and online.

Head researcher	OLIVELLA NADAL, JORDI
Title	Europe-Brazil-Bolivia-Cuba Capacity Building using globally available digital learning modules.
Funding institution	Commission of European Communities
Reference	618925-EPP-1-2020-BR-EPPKA2-CBHE-JP
Start-up date	15/01/2021
Completion date	14/01/2024

Summary

EUBBC is a digital education skills training project aimed at three Latin American countries with different needs and developments in digital education: Brazil, Bolivia, Cuba and five European Union participants.

EUBBC-Digital M18 Meeting

Head researcher	OLM MIRAS, JOSEP MARIA
Title Distributed control strategies for the traffic management of AGV-based in-house transportation systems.	
Funding institution AGAUR. Agència de Gestió d'Ajuts Universitaris i de	
Reference	2021 DI 016
Start-up date	06/09/2021
Completion date	06/09/2024

Summary

The deployment of Automated Guided Vehicles (AGV) to carry out in-house transportation tasks is a key element to improve efficiency in the logistics of Industry 5.0-inspired smart factories. However, the standard requirements of logistics schemes such as flexibility, reconfigurability, reusability, scalability or energy-efficiency, pose a number of challenging open –from the optimality side– control problems to be addressed. The thesis will be focused on the development of distributed control strategies for the traffic management of AGV-based in-house transportation systems encompassing: (a) the task scheduling and route planning of the fleet in an integrated fashion and with a high level of decentralization, and (b) the route execution of the individual AGVs during operation in potentially mixed scenarios with improved collision avoidance and deadlock properties.

Head researcher	PANADERO MARTÍNEZ, JAVIER
Title	Artificial Intelligence to Improve the Learning Experience in Universities with Online and Hybrid Models
Funding institution	AGAUR. Agència de Gestió d'Ajuts Universitaris i de Recerca
Reference	2021 LLAV 00009
Start-up date	12/10/2022
Completion date	11/07/2023

Summary

The AILEU (Artificial Intelligence to Improve the Learning Experience in Universities with Online and Hybrid Models) project focuses on developing an AI initiative in the education sector aimed at enhancing student performance and reducing dropout rates. By employing data-driven intelligent systems, the project seeks to enhance personalized tools and decision-making processes for students. This involves recommending suitable master's majors based on individual profiles and predicting dropout probability. By offering personalized recommendations and identifying students at risk of dropping out early, the project aims to improve the decision-making process for students and ultimately enhance overall student success and retention in higher education.

By conducting a comprehensive examination of commercial, legal, and technological viability, the project aims to enhance machine learning models for predicting dropout rates and generating recommendations. Seamless integration with academic platforms is essential, necessitating the creation of robust APIs and collaboration with educational partners. Furthermore, the project underscores its market advantage due to limited competition and promising revenue projections, despite potential barriers at public universities. Overall, the project's objectives drive iterative refinement and strategic adjustments to ensure its effectiveness and viability in the educational environment.

Head researcher	PEÑA CARRERA, MARTA

Title Assessment and implementation of Agriculture and Life Science Universities' first Gender Equality plans in Widening Countries. HORIZON-WIDERA-2022-ERA-01 Coordination and Support Action 101094158.

Funding institution	Commission of European Communities
Reference	HORIZON-101094158-AGRIGEP
Start-up date	01/01/2023
Completion date	31/12/2025

Summary

Across the EU, the development of Gender Equality Plans (GEP) intends to address the problems at RPOs; however, the variability in capability, capacity, and expertise hinder the efficient implementation of the institutional GEPs. Additionally, there are specific GE issues within certain fields of study at research and education institutions. In this context, GE issues in the Science, Technology, Engineering and Mathematics (STEM) fields are well known and specific action plans have been developed. Within STEM, agriculture and life-science focused RPOs face very similar problems, but they lack sector-specific measures and mitigation plans. Furthermore, in agriculture, a large GE sector-specific imbalance exists in developing countries where a relevant proportion of RPOs' international students come from.

The AGRIGEP project, with the joint efforts of six consortium partners, aims to perform a responsible assessment of widening RPOs' current status on GEP implementation, improve capabilities through intensive capacity building, and develop and implement an agriculture and life-science targeted GEP with sectorial specific measures and strategies. These results could lead to long-term institutional reforms. Additionally, this project works to establish the inclusion of GE issues within the RPOs' educational system and professional training of students. The realisation of these objectives and the implementation of inclusive GEPs will enhance the inclusiveness, reputation, attractiveness, and research excellence of widening country RPOs. Moreover, it will promote the transformation of institutions and advance GE within the ERA as well.

Head researcher	SEBASTIEN PONSICH, ANTONIN
Title Sustainable solutions for the evaluation, design and planning of electrification projects in rural areas of South American countries.	
Funding institution	Centre de Cooperació per al Desenvolupament de la UPC
Reference	CCD-2023-B009
Start-up date	01/06/2023
Completion date	31/05/2025

Summary

For more than 12 years, the DOPS group has been developing a research line to support rural electrification promoters in developing countries in the design of renewable energy projects. Currently, DOPS has extended this line to the evaluation of already implemented projects and energy planning at a regional or district level. The three types of problems (assessment, design and planning) are based on multi-criteria computational methodologies that take into account all dimensions of sustainability, with a particular focus on environmental protection and the promotion of gender equality. Projects are considered in three Latin American countries: Brazil, where national programs provide a multitude of case studies to evaluate; Colombia and Bolivia, in the energy development phase, where electrification plans and processes of evaluation and design of new systems are required. This project aims to identify relevant practices and conditions in order to extrapolate the results to other contexts around the world.

Head researcher	SEBASTIEN PONSICH, ANTONIN
Title	Planning and evaluation tools for rural electrification projects on a regional scale II
Funding institution	Centre de Cooperació per al Desenvolupament de la UPC
Reference	CCD-2022-B003
Start-up date	01/06/2022
Completion date	31/05/2023

Summary

The SCOM-UPC group has been developing for more than 12 years a research line to support rural electrification promoters in developing countries in the design of projects based on renewable energies. Currently, SCOM-UPC is dedicated to the evaluation of projects implemented in different contexts, as well as the planning of electrification and the design of new projects at local and regional scale. These two axes take into account all dimensions of sustainability, including actions for climate change mitigation, and are based on systematized multi-criteria methodologies. Projects are considered in three Latin American countries: Brazil, where national programs provide a multitude of case studies to be evaluated; Peru and Colombia, both in the energy development phase, where electrification plans and new project design processes are required. This project aims to identify appropriate practices and relevant conditions, in order to extrapolate the results to other contexts around the world.

Head researcher	SUAREZ FEIJOO, RAUL
Title Resilient manufacturing lines based on smart handling systems - Smarthandle	
Funding institution	Commission of European Communities
Reference	HORIZON-101091792-SMARTHANDLE
Start-up date	01/01/2023
Completion date	31/12/2025

Summary

Manual and automated production lines must evolve to "produce more and diverse with less", however they need to address shortcomings such as:

- High product variants requiring tool level dexterity and resource level reconfigurability

- Lack of cognitive perception systems to allow autonomous reasoning and operation

- Absence of adaptable control to accurately handle a variety of workpieces and materials, and

- Inefficiency of planning systems in addressing holistically all hierarchical production levels.

SMARTHANDLE will research technologies to address these needs and support European industry, by implementing:

a) intelligent, reconfigurable agents to provide dexterity in a range of handling applications,

b) AI based reasoning enablers to optimize the flexibility potential of these agents

c) Higher-level planning and coordination mechanism to allow the successful and scalable deployment of such solutions in real life use cases.

SMARTHANDLE is a research and innovation action (RIA), nevertheless, it acknowledges that such technologies can be meaningful only if they lead to solutions that address real life needs. Thus it has engaged 3 use cases from the consumer goods (handling of deformable, delicate and high precision parts: contact lenses), Metal Industries (packaging of large variable section materials: aluminum profiles) and automotive tier-1 suppliers (disassembly of complex products: batteries) involving dexterous operations that are not possible to implement with the existing technologies. SSH aspects will be addressed, demonstrating benefits for workers by reducing their involvement in unsafe and unhealthy tasks, improving their working conditions when working in areas where the SMARTHANDLE reconfigurable solutions will operate.

The SMARTHANDLE consortium is made up of 14 European Partners from Belgium (1), Germany (2), Greece (3), Luxemburg (1), Netherlands (4), Spain (3):
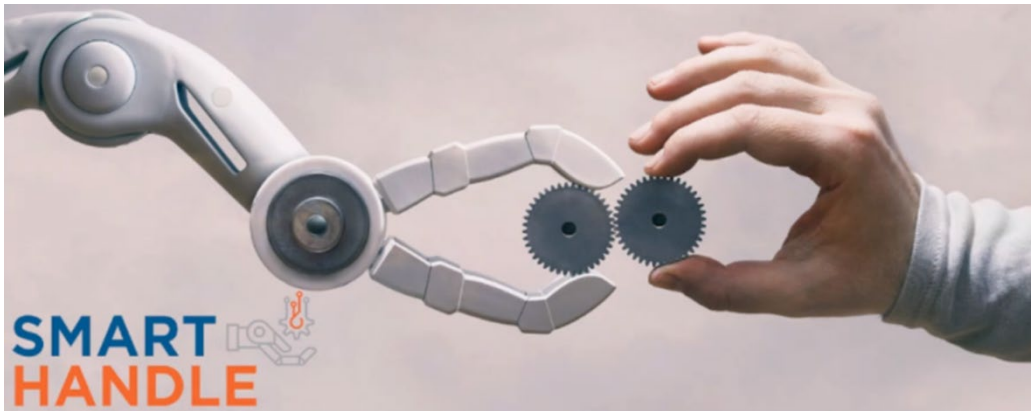
Head researcher	SUAREZ FEIJOO, RAUL
Title AI-Powered Manipulation System for Advanced Robotic Service, Manufacturing and Prosthetics - Intelliman	
Funding institution	Commission of European Communities
Reference	HORIZON-101070136-IntelliMan
Start-up date	01/09/2022
Completion date	28/02/2026

Summary

A key challenge in intelligent robotics is creating robots that are capable of directly interacting with the world around them to achieve their goals. On the other hand, robot manipulation is central to achieve the promise of robotics, since the definition of robot requires that it has actuators that it can use to change the world. In the last decades, a substantial growth has been observed in research on the problem of robot manipulation, which aims to exploit the increasing availability of affordable robot arms and grippers to create machines capable of directly and autonomously interacting with the world to implement useful applications. Learning will be central to such autonomous systems, as the real world contains too many variations for a robot to have an accurate model of human requests and behaviour, of the surrounding environment, the objects in it, or the skills required to manipulate them, in advance.

The main objective of the IntelliMan project is focusing on the question of "How a robot can efficiently learn to manipulate in a purposeful and highly performant way". IntelliMan will range from learning individual manipulation skills from human demonstration, to learning abstract descriptions of a manipulation task suitable for high-level planning, to discovering an object's functionality by interacting with it, to guarantee performance and safety. IntelliMan aims at developing a novel AI-Powered Manipulation System with persistent learning capabilities, able to perceive the main characteristics and features of its surrounding by means of a heterogeneous set of sensors, able to decide how to execute a task in an autonomous way and able to detect failures in the task execution in order to request new knowledge through the interaction with humans and the environment. IntelliMan further investigates how such AI-powered manipulation systems are perceived by the users and what factors enhance human acceptability.

The IntelliMan consortium is made up of 13 European Partners from Germany (3), Italy (4), Slovenia (1) and Spain (2), Switzerland (2) United Kingdom (1)

Head researcher	SUÁREZ FEIJOO, RAÚL/ ROSELL GRATACOS,JAN
Title	Core Capabilities for Robot Co-workers (CaRo)
Funding institution	Agencia Estatal de Investigación
Reference	PID2020-114819GB-I00
Start-up date	01/09/2021
Completion date	31/08/2025

Summary

"Full automation" with "fully autonomous, intelligent and dexterous robots" is commonly presented as the ultimate goal of robotic automation. However, there are examples that show that robots have not yet achieved the intelligence and skills needed to solve some tasks, particularly when uncertainty (from different sources) is significant, or, if the robots can solve the tasks, they are very inefficient. This has led to the concept of robot co-worker, a robot "sufficiently skillful and intelligent" and "sufficiently autonomous" destined to work as a collaborator of the human being, who has the necessary knowledge and capabilities to seek for solutions to solve the tasks in certain situations.
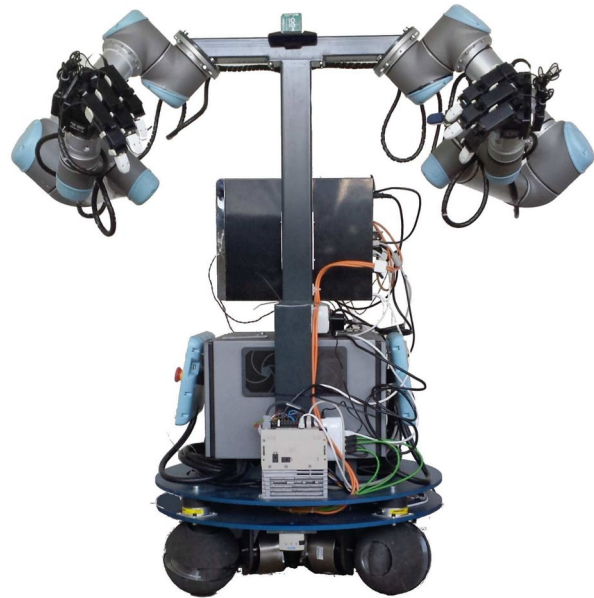
The concept of robot co-worker is not new, and it is more and more significant in the current state of robotics, although many different technical requirements are still far away from being solved. A robot co-worker should be prepared to work jointly with the human in work spaces not adapted to it (at least not fully) but rather adapted to the human, and the robot should be able to act in such a way that the efficiency of the work done jointly with the human is greater than that of the work of both working separately. This implies that the robot co-workers must have specific capabilities (regarding intelligence and skills) to be autonomous enough during their collaboration with humans. In this line, the general objective of the project is to advance in the development of core capabilities for dual-arm robot co-workers, developing tools to provide the robots with manipulation capabilities that make them: a) able to work in semi-structured human environments and cope with uncertainty in the knowledge of the state of the environment and in the action outcomes; b) able to successfully execute a sequence of actions despite potential variations in the environment; c) able to fluently interact with other robots and with humans, trying to perform human-like movements to facilitate the interaction, d) able to exploit the dexterity given by two mechanical hands. Following this general objective, the project aims to contribute according to the following specific objectives: a) Development of tools for perception and reasoning, from the point of view of the information processing to understand the environment and the current situation of the task to be solved; b) Development of adaptive and dynamic methods for planning tasks and movements taking into account the uncertainty in the state of the environment, generating plans that can be adapted flexibly and quickly to the real situation of

the environment to avoid replanning; c) Development of robust strategies for bi-manual grasping and manipulation, with particular emphasis on in-two-hand manipulation; and, d) Exploit the current fast state-of-the-art communication technologies, like 5G, in the communications between an operator and a robot, between robots, or between a robot and a distributed computer system. The proposed solutions will be validated in a real experimental setup specifically prepared in the project, including a dual-arm robot with dexterous capabilities that will be used as robot co-worker. Finally, as in all the developments of the group, the problems will be addressed looking for general solutions valid for industrial as well as for service robotics.

Head researcher	SUÁREZ FEIJOO, RAÚL (at IOC)
Title	Industrial Doctorate Training Network on Future Wireless Connected and Automated Industry enabled by 5G.
Funding institution	Commission of European Communities
Reference	H2020-956670-5GSmartFact
Start-up date	01/03/2021
Completion date	28/02/2025

Summary

5GSmartFact is an MSCA-ITN project funded by the EU whose objective is to study, develop, optimize and assess the

deployment of 5G networks that target the IIoT requirements (in terms of availability, ultra-low latency, reliability, amount of supported devices, localization accuracy and energy efficiency) in factory environments, and exploit them to integrate factory applications (especially those related to robot-control and robot navigation) which might lead to a complete redesign of networked robot architectures and hence to a leap forward in the industry automation .

Head researcher	DÒRIA-CEREZO, ARNAU
Title Sound control for the safety of the new generation of electric vehicles. SS4S.	

Funding institution	Agencia Estatal de Investigación
Reference	EIN2020-112372
Start-up date	01/11/2020
Completion date	31/10/2022

Summary

There is an undeniable trade-off in new electric and hybrid vehicles regarding their sound quality. Comfort and sound brand perception compete with safety-related issues because their current quietness and low detectability endanger vulnerable road users. This new scenario requires the traditional strategy of noise reduction to be reconsidered and re-shaped into a more refined strategy based on the improvement of noise quality, annoyance reduction, and improved vehicle recognition. This is the reason why its development for the next generation of vehicles requires international cooperation of multiple disciplines in electrical and mechanical engineering.

In this context, SS4S (Sound shaping for safety in the next generation of electric vehicles) will create a unique interdisciplinary network of leading OEMs, automotive industries, automotive research companies, and top European universities to successfully write research and training oriented proposals to address the major sound quality challenges of the next generation of vehicles. The result of this project will be the presentation of an MSCA proposal under Horizon Europe (2021-27).

Head researcher	BENEDITO BENET, ERNEST
Title	Customer Quality 4.0
Funding institution	Agència de Gestió d'Ajuts Universitaris i de Recerca
Reference	2019 DI 033
Start-up date	16/09/2019
Completion date	25/09/2023

Summary

We carry out a comprehensive evaluation of technical queries to ensure the excellence of the final products of SEAT. With the help of emerging technologies such as Internet of Things, Big Data & Analytics, Artificial Intelligence and Blockchain, among others, new services and applications of Customer Quality can be created. The main goal of this project is to develop new technological solutions that allow SEAT to streamline the process of analysis and resolution of technical queries in Customer Quality department.

Head researcher	BAUTISTA VALHONDO, JOAQUÍN
Title	Optimisation of the production of hybrid workshops linked by sequenced units.
Funding institution	Agencia Estatal de Investigación
Reference	PGC2018-095080-B-I00
Start-up date	01/01/2019
Completion date	30/09/2022

Summary

We will solve programming and sequencing problems in mixed-model lines and workshops of regular flow (Flow Shop environment), as well as mixed-product assembly line balancing problems, taking as reference the Automotive sector. In our formulation, we will consider: the influence of the human factor, the uncertainty of the environment and the flexibility of the productive system. We will model, the effects produced by the human factor, the uncertainty of the demand and the flexibility to execute the operations, on the following elements:

- Work stations, series and parallel, with assigned tasks that present homogeneous and heterogeneous processing times.
- The limitations on time, space and security, between production stages.
- The sequence of models conditioned by the delivery in batches of pieces or jobs.
- Operational costs due to production drops and downtime.
- The robustness of the attributes of a solution versus the variation of the technological and economic environmental conditions.

Agreements with companies

| Head researcher	ARIAS PUJOL, ANTONI
Title Extension of contract for stability analysis and design of control algorithms for power electronics converters.	
Funding institution	UNIVERSIDAD DEL PAIS VASCO
Reference	
Start-up date	30/10/2021
Completion date	30/06/2024

Summary

The purpose of the contract is to design digital algorithms to control for power electronics converters working in "Flexible Power Links (FPL)". The project is still on-going and hopefully will bring experimental results in the next year.

Head researcher	ARIAS PUJOL, ANTONI
Title	Power Factor Conditioner. 230V 400W
Funding institution	POWER INNOTECH
Reference	
Start-up date	20/12/2020
Completion date	20/12/2021

Summary

A 1.2kW single phase AC mains connected (230VAC 50Hz) and DC (400V) output power supply with power factor compensator has been designed.

The figure shows an experimental waveform taken from
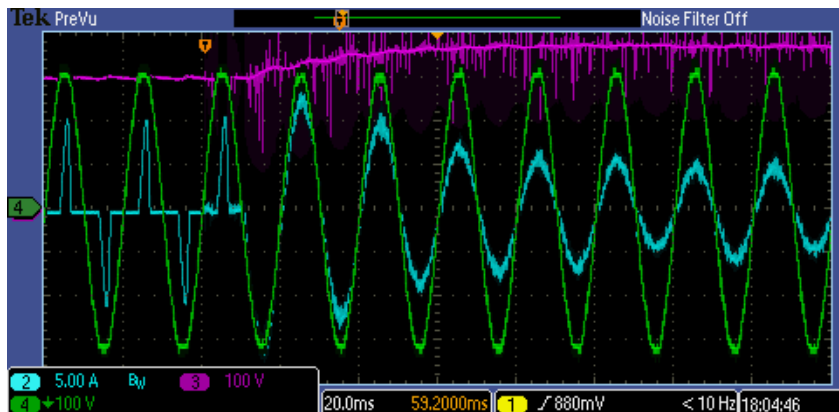
the built prototype. In green the AC sinusoidal waveform (230Vrms 50Hz), in light blue the AC mains current and in magenta the DC output voltage. Note how the input current is sinusoidally shaped when the algorithm starts and how the DC output voltage is increased, as required.

| Head researcher	DÒRIA-CEREZO, ARNAU
Title Measurement of the draw and vibrations of a permanent magnet	
Funding institution	NISSAN Tech. Centre Europe Spain
Reference	
Start-up date	01/09/2022
Completion date	31/01/2023

Summary

The objective of this work is to measure the noise and vibrations of a permanent magnet synchronous motor to evaluate how different strategies of modulation and control of the electric motor at its NVH level. Measure noise and vibrations of a permanent magnet synchronous motor to evaluate how different strategies of modulation and control of the electric motor at its NVH level.
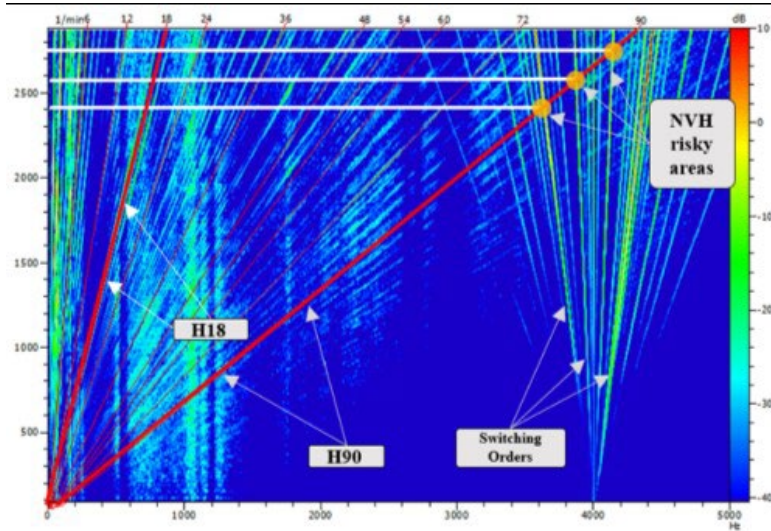
Head researcher	GRIÑÓ CUBERO, ROBERT
Title Redesign of the current loop controllers of three-phase VSI converters connected to extremely weak electrical networks.	
Funding institution	FUND. TECNALIA RESEARCH&INNOVATION
Reference	
Start-up date	28/04/2023
Completion date	28/02/2024

Summary

The objective of the project is the structural and parametric redesign of the controllers of the current control loops of three-phase (3-wire) VSI converters connected to the grid, in order to maintain correct operation with extremely weak electrical networks (short-circuit ratio, SCR in [1, 20]).

Head researcher	LUSA GARCIA, AMAIA
Title	Chair agreement Vanderlande Industries España, S.A.U.
Funding institution	Vanderlande Industries España,S.A.
Reference	
Start-up date	01/05/2022
Completion date	30/04/2025

Summary

Chair with Vanderlande Industries España, S.A.U.-UPC to promote training, research, research transfer and scientific dissemination in the field of logistics process automation (especially in airports and

warehouses). The activities of this Chair project include training sessions for students, visits to Vanderlande's factory in Santpedor and the Aeroport Josep Tarradellas Barcelona - El Prat (handling structures and processes), Bachelor and Master thesis challenges and the collaboration with the eRacing ETSEIB team (https://eracingetseib.upc.edu/). More information can be found on the Chair website: https://catedravanderlande.upc.edu

Head researcher	OLIVELLA NADAL, JORDI

Title   Collaboration contract to provide technical support to the company MASATS in the study of the impact of automatic braking systems in urban buses.

Funding institution	S.A. MASATS-TRANSPORTS GENERALS
Reference	
Start-up date	16/06/2023
Completion date	31/07/2023

Summary

Technical support to the company MASATS for the study of the impact of automatic braking systems in urban buses. On the one hand, these automatic braking systems can reduce the number of accidents with victims and the severity of the consequences, by preventing collisions or reducing their severity. In buses with standing passengers, however, the automatic braking system can generate falls and a greater number and severity of accidents.

The proposed study will analyze the favorable and unfavorable effects of the use of automatic braking systems in urban areas in Spain, based on the known experience in this regard and to support the company's decision making in relation to its adoption.

Head researcher	OLIVELLA NADAL, JORDI
Title Conveni ASEPEYO	
Funding institution	ASEPEYO
Reference	
Start-up date	15/07/2021
Completion date	14/07/2023

Summary

According to the collaboration agreement signed on 22 September in Barcelona between the UPC and ASEPEYO, ASEPEYO will provide the data to be analysed and its knowledge of the risks, while the UPC, through the Institute for the Organisation and Control of Industrial Systems (IOC), will carry out the necessary analyses. The studies to be carried out will focus on aspects such as the characterisation of accidents that cause serious and fatal injuries and those that cause minor injuries, the seasonality of the accident rate and the risk factors that contribute to the increase in the accident rate, among others. To carry out these analyses, the use of Artificial Intelligence (AI) methods is envisaged.

Head researcher	ESTEBAN PEÑA PITARCH
Title	Copropietat patent/'pelvic floor muscle strength measuring device'.
Funding institution	FUNDACIÓ ALTHAIA
Reference	
Start-up date	25/03/2011
Completion date	25/03/2031

Summary

Device for measuring pelvic floor muscle strength, comprising a speculum (1) formed by two pivoting coupled parts (11, 12), each of said parts with a grip area (31, 32) and a front area (41 , 42) intended to be inserted into the vagina, where a displacement sensor (2) is attached to the front area (31, 32) of the speculum of surface electrodes, with a spring (21) of known constant K, where said spring (21) has a wire diameter between 0.5 and 1 mm, and associated with a displacement reading module (50). It also has a parasitic force measurement system through surface electrodes (52) associated with a force reading module (51).
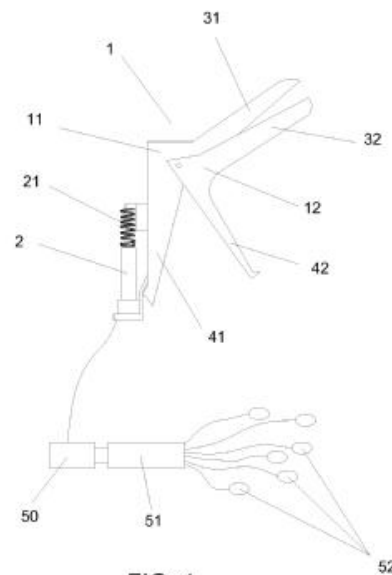
FIG. 1

8. Publications

Journals articles

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Conference publications

1. Bautista, J.; Alfaro, R.. **Heijunka mixed model sequencing problem with no buffers and work overload minimization**. 17th International Conference on Industrial Engineering and Industrial Management / XXVII Congreso de Ingeniería de Organización. 03/07/2023.

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Books

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1. Alfaro, R.; Bautista, J.. **Heijunka in mixed-model sequences with minimum work overload: economic impact**. *IoT and data science in engineering management. CIO 2022. Lecture Notes on data engineering and communications technologies*. Springer. 2023. Pàgs: 395 ~ 401. ISBN: 978-3-031-27914-0. https://link.springer.com/book/10.1007/978-3-031-27915-7.

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4. Bautista, J.; Alfaro, R.. **Blocking flowshop scheduling problem with minimum makespan and quota property**. *IoT and data science in engineering management. CIO 2022. Lecture notes on data engineering and communications technologies*. Springer. 2023. Pàgs: 185 ~ 190. ISBN: 978-3-031-27914-0. https://link.springer.com/book/10.1007/978-3-031-27915-7.

5. El-Madafri, I.; Peña, M.; Noelia Olmedo-Torre. **Applying artificial intelligence models for the automatic forest fire detection**. *Avenços en recerca i desenvolupament del Departament d'Enginyeria Gràfica i de Disseny*. OmniaScience Monographs. 2023. Pàgs: 95 ~ 104. ISBN: 9788412647518. https://www.omniascience.com/books/index.php/monographs/catalog/book/140 .

6. Juanpera, M.; Ferrer-Martí, L.; Marianna Garfi'; Domenech, B.; Pastor, Rafael. **A novel method for integrated multicriteria decision-making with uncertainty: A case study on sustainable agriculture in Colombia**. *Decision science - Recent advances and applications*. IntechOpen. 2022. Pàgs: 1 ~ 16.

7. Mateo, M.; Anich, N.. **Reconfiguration of multi-business chains through vertical synergies**. *IoT and data science in engineering management*. Springer. 2023. Pàgs: 31 ~ 36. ISBN: 978-3-031-27914-0. https://link.springer.com/book/10.1007/978-3-031-27915-7 - toc.

8. Noelia Olmedo-Torre; Peña, M.; Soriano, M.; Pujol Ferran, A.. **Aprendizaje activo con PBL en el diseño instruccional de Expressió Gràfica**. *Avenços en recerca i desenvolupament del Departament d'Enginyeria Gràfica i de Disseny*. OmniaScience. 2023. Pàgs: 56 ~ 70. ISBN: 978-84-126475-1-8. https://www.omniascience.com.

9. Padilla-Magana, J.; Peña-Pitarch, E.; Ticó, N.; A. Al Omar; Alcelay, J. I.. **ARAT Test with multisensory information**. *Digital human modeling and applied optimization*. 2022. Pàgs: 99 ~ 106. https://openaccess.cms-conferences.org/publications/book/978-1-958651-22-3.

10. Porto, A.; Lusa, A.; Henao, C.. **Annualized hours, multiskilling, and overtime on annual staffing problem: a two-stage stochastic approach**. *Industry 4.0: the power of data*. Springer. 2023. Pàgs: 109 ~ 117. ISBN: 978-3-031-29381-8. https://www.springer.com/series/11786.

9. Prizes and awards

Bautista, J.; Alfaro, R.. **Best Paper for Parallel Session award at ICIEM-CIO. 16th International Conference on Industrial Engineering and Industrial Management (ICIEIM) – XXVI Congreso de Ingeniería de Organización (CIO2022)**. 2022. *Blocking flowshop scheduling problem with minimum makespan and Quota property*. **Primer premi**. SIR-OPE - Service and Industrial Robotics - Operation, Production and Enterprise.

Peña, M.. **Reconeixement als mèrits docents d'especial qualitat 2016-2021**. 2022. *Reconeixement als mèrits docents d'especial qualitat 2016-2021*. **Accèssit**. SOC-STEM - Impacte Social de les STEM.

10. Extracurricular activities

Master executive in Lean Supply Chain Management. Direcció d'Operacions I Logística - Master's degree. Face-to-face.

Academic management: Rúa Costa, Carles; August Casanovas.

Presentation

Traditional functions in companies such as production, distribution, planning or logistics have evolved with the change in economic cycles. The productive function has adapted to the new needs of markets, incorporating new trends such as Lean Manufacturing¿ and embracing quality control, training or staff motivation as part of its tasks. Likewise, logistics have also changed, and the concept Integrated Logistics has come to comprise all the value chain between the customer and the supplier, as well as the flow of information and materials.

Integrated management of the distribution chain, production and supplies is now known as Supply Chain Management. The emergence of logistics has forced governments to work on improving and updating infrastructures roads, railway, ports and airports and this, together with staff training and research and innovation as key aspects to increase the level of competitiveness in the business fabric.

This Master's Degree aims to be unique and exclusive, a reference point for all professionals aiming to develop their career in the areas of logistics, distribution, supplies and, in general, Year aspect relating to the supply chain management and design. To make this possible, the course has included prestigious professionals from the main European universities (CRANFIELD) and leading schools in specific areas (European Short Sea Shipping School). For this Masters we also have the collaboration of managers from the leading logistics companies in Spain, who will transmit their experiences to the students.

AIMS

- TO PUT INTO QUESTION, THE CURRENT ORGANISATIONAL AND MANAGEMENT SYSTEMS IN THE LOGISTICS CHAIN.
- TO STRATEGICALLY ANALYSE, ORIENT AND DEFINE THE ENTIRE

LOGISTICS CHAIN AND ALL OF ITS DIFFERENT SECTORS, IMPLEMENTING AND ADAPTING NEW TECHNOLOGIES TO BOOST COMPANIES LOGISTICS SERVICES.

- TO DESIGN AND IMPLEMENT NEW SYSTEMS AND METHODOLOGIES TO IMPROVE THE MANAGEMENT OF THE RELATIONSHIPS AMONG PROVIDERS, BUSINESSES, OPERATORS AND END CLIENTS.

- TO EFFECTIVELY MANAGE PERSONNEL TEAMS THAT NEED TO COLLABORATE WITH THE CULTURAL CHANGE IMPLIED IN IMPLANTING AN INTEGRATED STRATEGY OF SUPPLY CHAIN MANAGEMENT

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https://www.talent.upc.edu/cat/estudis/formacio/curs/203200/master-formacio-permanent-executive-supply-chain-management-operacions-logistica/