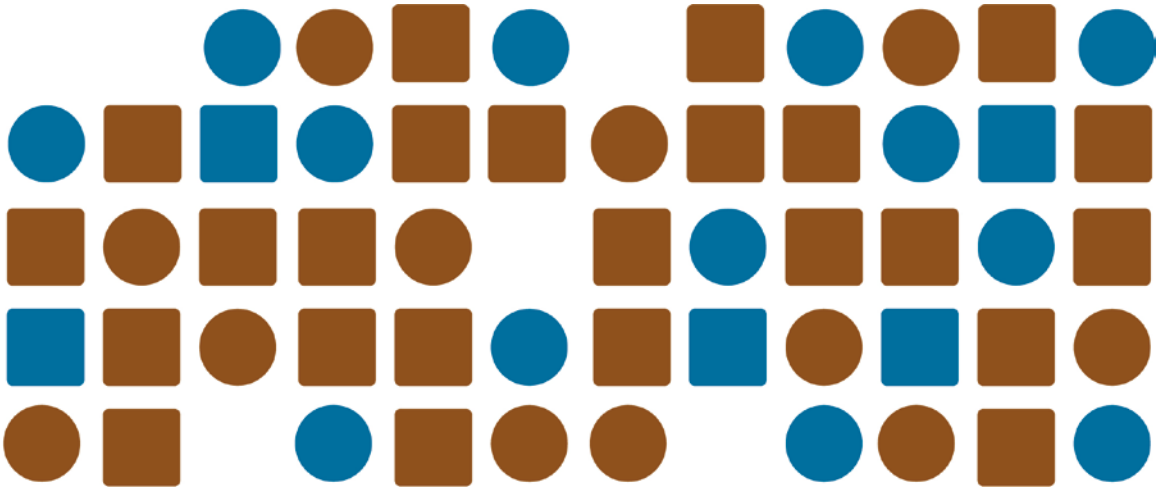


IOC

Institute of Industrial and Control Engineering

Activities Report 2021

UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Institute of Industrial and Control Engineering

Table of contents

1. Organisational structure and governing bodies

Management

Director	ROBERT GRIÑÓ CUBERO
Assistant director	ERNEST BENEDITO BENET
Secretary	JAN ROSELL GRATACÒS until 20/06/2021 BRUNO DOMÈNECH LEGA from 21/06/2021
Technical and Management Support Area - UTGAEIB	M. LOURDES DURANY VIDAL

The Board

Director	ROBERT GRIÑÓ CUBERO
Assistant director	ERNEST BENEDITO BENET
Secretary	JAN ROSELL GRATACÒS until 20/06/2021 BRUNO DOMÈNECH LEGA from 21/06/2021
Representative of the **Control** division	DOMINGO BIEL SOLÉ until 25/03/2021 OLM MIRAS JOSEP M. from 26/03/2021
Representative of the Supply Chain and Operations Management (**SCOM**) division	AMAIA LUSA GARCÍA until 25/03/2021 LAIA FERRER MARTÍ from 26/03/2021
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	LAIA FERRER MARTÍ until 25/03/2021 Vacancy from 26/03/2021 until 06/12/2021 JAN ROSELL GRATACÒS from 07/12/2021
Representative of administrative and service staff	LEOPOLD PALOMO AVELLANEDA

The Council

Arias Pujol, Antoni	
Batlle Arnau, Carles	
Bautista Valhondo, Joaquin	
Benedito Benet, Ernest	Assistant director
Biel Solé, Domingo	Representative of the Control division
Calleja Sanz, Gema	
Domenech Lega, Bruno	Secretary - From 21/06/2021
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
Lusa Garcia, Amaia	Representative of the Supply Chain and Operations Management-SCOM division
Martínez Costa, M. Carme	Until 31/08/2021
Mas Casals, Orestes	
Mateo Doll, Manel	
Olivella Nadal, Jordi	
Olm Miras, Josep Maria	
Palomo Avellaneda, Leopold	Representative of administrative and service staff
Pastor Moreno, Rafael	
Peña Carrera, Marta	
Peña Pitarch, Esteban	
Ponsich, Antonin Sebastien	from 04/03/2021
Roig Fernández, Vicenç	Representative of administrative and service staff
Rosell Gratacòs, Jan	Secretary until 20/06/2021
Suárez Feijóo, Raúl	Representative of the Robotics division

2. Staff

GLOSSARY

DIVISIONS/SERVICE	CTL	Division of Automatic Control
	SCOM	Division Supply Chain&Operations Management
	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
Arias Pujol	Antoni	CTL	TU
Batlle Arnau	Carles	CTL	TU
Bautista Valhondo	Joaquin	ROB	CU
Benedito Benet	Ernest	SCOM	AG
Biel Solé	Domingo	CTL	TU
Calleja Sanz	Gema	SCOM	LT
Cardoner Parpal	Rafel	SSR	PAS LAB.
Cunillera Marquez	Albert	ROB	PAS LAB. until 31/05/21
Domènech Lega	Bruno	SCOM	AG
Dòria Cerezo	Arnau	CTL	AG
Ferrer Llop	Josep	CTL	CU

NAME		DIVISIONS/ SERVICE	CATEGORIES
Ferrer Martí	Laia	SCOM	CU
Fossas Colet	Enric	CTL	CU
Galleguillos Pozo	Rosa	SCOM	BR
García Villoria	Alberto	SCOM	AG
Griñó Cubero	Robert	CTL	TU
Juanpera Gallel	Marc	SCOM	BR
Leduchowicz Municio	Alba	SCOM	BR
Lusa García	Amaia	SCOM	CU
Martínez Costa	Carme	SCOM	TU until 31/08/21
Mas Casals	Orestes	ROB	TU
Mateo Doll	Manuel	SCOM	TU
Miró Valero	Enric	SSR	PAS LAB.
Olivella Nadal	Jordi	SCOM	TU
Olm Miras	Josep M.	CTL	AG
Palomo Avellaneda	Leopold	SSR	PAS LAB.
Pastor Moreno	Rafael	SCOM	CU
Peña	Marta	CTL	AG
Peña Pitarch	Esteban	ROB	TU
Ponsich	Antonin Sebastien	SCOM	LT from 04.03.23
Repecho Del Corral	Victor	CTL	LT

NAME		DIVISIONS/ SERVICE	CATEGORIES
Rosell Gratacòs	Jan	ROB	TU
Suárez Feijóo	Raúl	ROB	DI

PhD Students

NAME		DIVISIONS/ SERVICE
Alaeddin	Mojtaba	CONTROL
Armadas Sabate	Alex	SCOM
Díaz Pacheco	Raúl Antonio	SCOM
Ferreira Vicente	Jéssica	SCOM
Guirao Berruezo	José Juan	ROB
Rahimi	Leyla	CONTROL
Rodríguez Pacheco	Carlos	ROB
Rojas De Silva González	Fco. Abiud	ROB
Ruiz Celada	Oriol	ROB
Urra González	Fernando	ROB

Visiting Staff

NAME		DIVISIONS	UNIVERSITY
Ponsich	Antonin Sebastien	SCOM	Universidad Autónoma Metropolitana (México) until 03/03/21
Pereira	Jordi	SCOM	Universidad Adolfo Ibáñez (Xile)

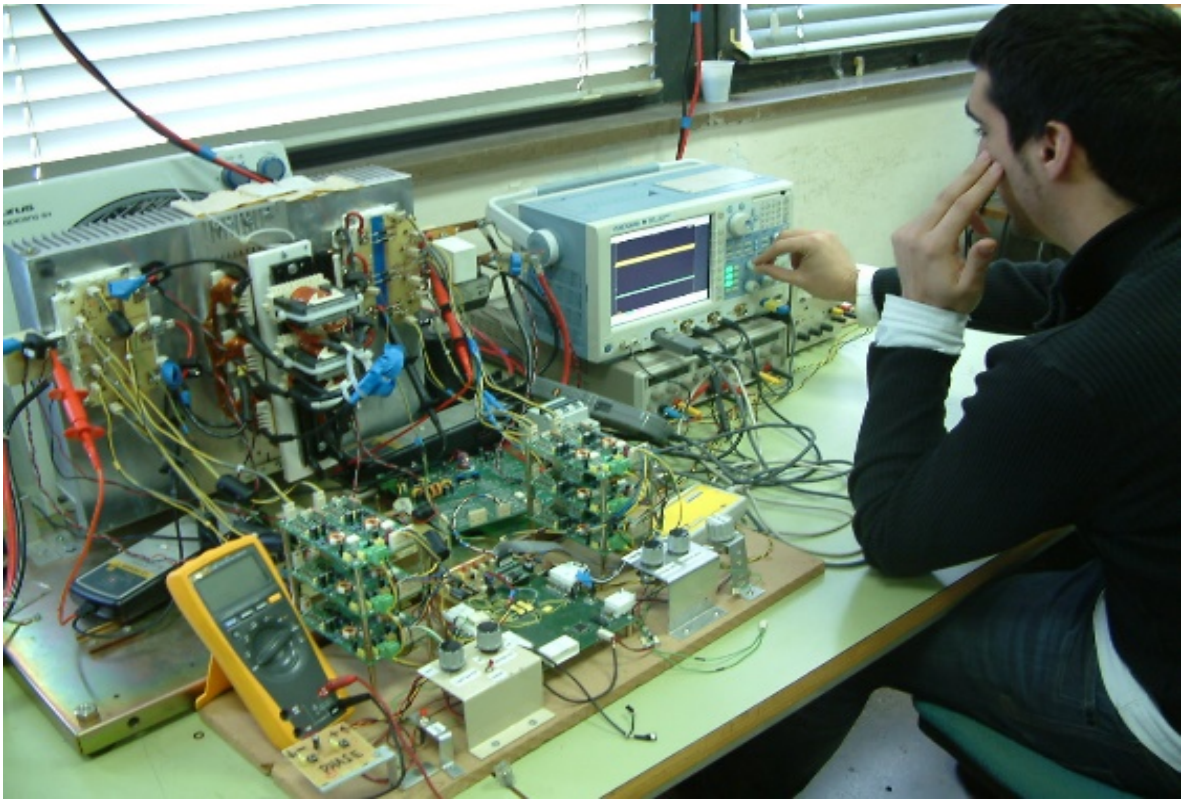
Incoming Students

NAME		DIVISIONS	UNIVERSITY
Reyes Montilla	Jose Gregorio	ROB	Università di Pisa
Zelloufi	Abdel-Nacer	CTL	ENSEA - França
Touzani	Hicham	ROB	IBISC - Paris Saclay/Evry University
Finelli	Antonio	ROB	University of Naples Federico II

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 Supply Chain & Operations Management

The Division of Supply Chain and Operations Management 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

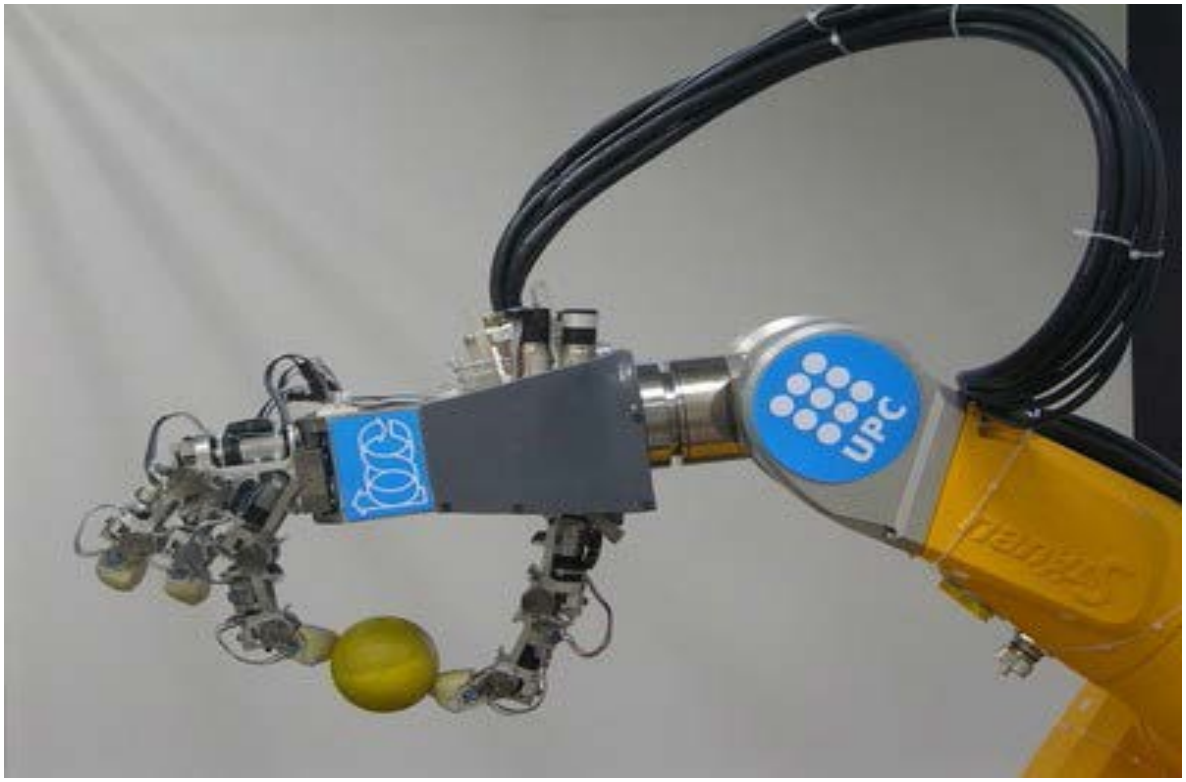
Fields of activity:
Supply Chain management and design
Operations management
Scheduling
Assembly line design and balancing
Working time planning and scheduling
Industry 4.0
LEAN management
Integrated aggregate planning
Strategic capacity planning
Urban logistics
Sustainability in transportation and distribution
Rural electrification with renewable energy and sustainable development in isolated areas

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

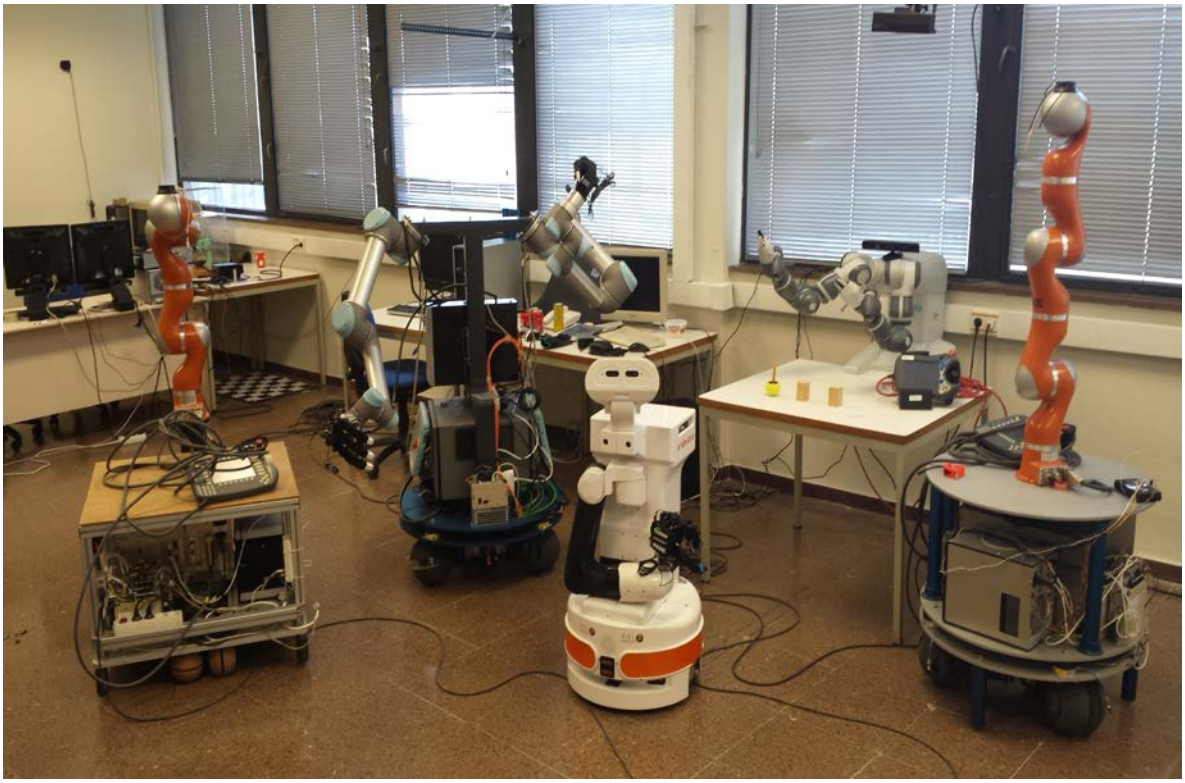
4. Facilities

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

The Institute has two robotics laboratorier; a control and electronics laboratory; a logistics laboratory; a computer network equipped with servers, workstations, PCs and software; 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 a digital blackboard and a projector with a capacity for 10 people.

Equipping research laboratories

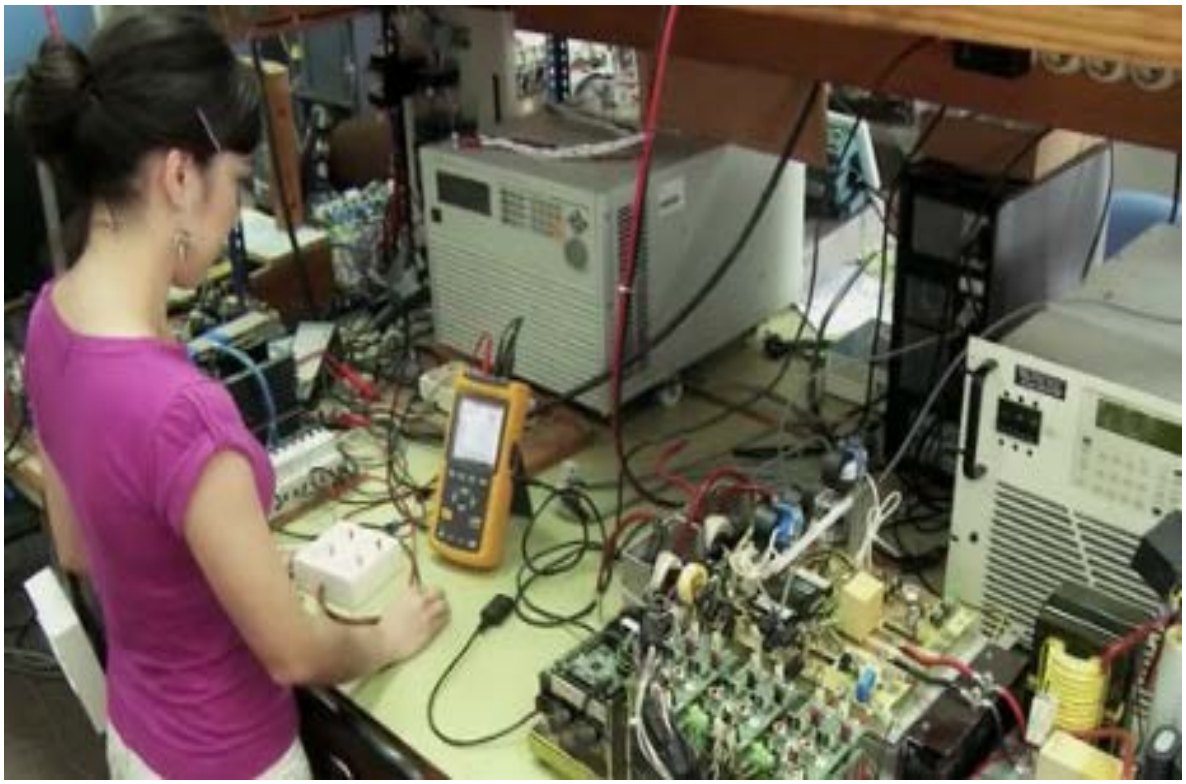
Robotics Laboratories



- 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.

SCOM Calculation Laboratory

- Several computers configured to make computing experiments in a rack platform protected by UPS; Also, others computers for doctoral, masters and designers.
- 1 server for intensive computationally problems, with 2 Intel Xeon CPU E5-2630 v4 with 64 GB of RAM.
- 1 server for intensive computationally problems, with 2 AMD EPYC 7543 32-Core Processor with 256 GB of RAM.
- Specialized software: IBM ILOG CPLEX Optimization Studio as others required to solve optimization problems.

5. University masters

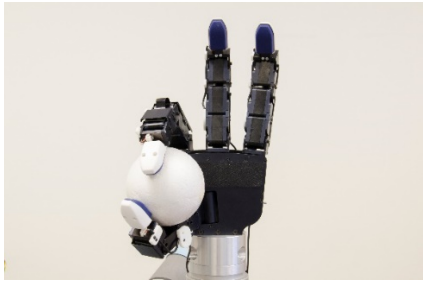
Master’s Degree in Automatic Control and Robotics

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)
- Dra. Alícia Casals Gelpí
- Dr. Andreu Català Mallofré
- Dr. Robert Griñó Cubero
- Dr. Rafael Pastor Moreno
- Dr. Vicenç Puig Cayuela
- Dr. Jan Rosell Gratacòs
- Dr. Alberto Sanfeliu Cortés

Doctoral data 2021

A. Program Coordinator	**RAÚL SUÁREZ FEIJÓO**
B. Number of students	**95** (2021/2022)
Thesis presented during 2021:	

Date	22/01/2021
Title	Knowledge Representation and Reasoning for Perception-based Manipulation Planning
Author	SHARAFELDEEN, MOHAMMED DIAB ELSAYED
Thesis Director	ROSELL GRATACOS, JOAN
Qualification	Excel.lent

Date	29/01/2021
Title	Contribución al modelado e implementación de un control avanzado para un proceso de cloración de una Estación de Tratamiento de Agua Potable
Author	GÁMIZ CARO, JAVIER FRANCISCO
Thesis Director Thesis Codirector	BOLEA MONTE,YOLANDA MARTINEZ GARCIA,HERMINIO
Qualification	Excel.lent Cum Laude

Date	18/03/2021
Title	Object Manipulation Based on Tactile Information
Author	MONTAÑO SARRIA, ANDRES FELIPE
Thesis Director	SUAREZ FEIJOO, RAUL
Qualification	Excel.lent Cum Laude

Date	17/05/2021
Title	Geometric computer vision meets Deep Learning for autonomous driving applications
Author	GARCÍA LÓPEZ, JAVIER
Thesis Director Thesis Codirector	MORENO NOGUER,FRANCESC D'ASSIS AGUDO MARTÍNEZ,ANTONIO
Qualification	Notable

Date	11/06/2021
Title	Leak Detection and Localization in Pipeline Networks Using Machine Learning and Principal Component Analysis
Author	DE LOS SANTOS RUIZ,ILDEBERTO
Thesis Director Thesis Codirector	PUIG CAYUELA,VICENÇ LÓPEZ ESTRADA,FRANCISCO RONAY
Qualification	Excel.lent

Date	01/07/2021
Title	Modeling and Control for a Fuel Cell System
Author	XING, YASHAN
Thesis Director Thesis Codirector	COSTA CASTELLO,RAMON NA, JING
Qualification	Excel.lent Cum Laude

Date	05/07/2021
Title	Position Analysis based on Multi-affine Formulations
Author	SHABANI, ARYA
Thesis Director Thesis Codirector	THOMAS ARROYO,FEDERICO PORTA PLEITE, JOSE MARIA
Qualification	Excel.lent Cum Laude

Date	23/07/2021
Title	Fashion Discovery: A Computer Vision Approach
Author	RUBIO ROMANO, ANTONIO
Thesis Director Thesis Codirector	MORENO NOGUER,FRANCESC D'ASSIS SIMÓ SERRA, EDGAR
Qualification	Excel.lent Cum Laude

Date	26/07/2021
Title	Automatic control advances in CPS security
Author	TRAPIELLO FERNÁNDEZ,CARLOS
Thesis Director Thesis Codirector	PUIG CAYUELA, VICENÇ CEMBRANO GENNARI, M.GABRIELA ELENA
Qualification	Notable

Date	13/09/2021
Title	Robust Economic Model Predictive Control of Smart Grids
Author	NASSOUROU, MOHAMADOU
Thesis Director Thesis Codirector	PUIG CAYUELA,VICENÇ BLESA IZQUIERDO,JOAQUIN
Qualification	Excel.lent

Date	13/10/2021
Title	Bridging the gap between reconstruction and synthesis
Author	PUMAROLA PERIS, ALBERT
Thesis Director Thesis Codirector	MORENO NOGUER, FRANCESC D'ASSIS SANFELIU CORTES,ALBERTO
Qualification	Excel.lent Cum Laude

Date	22/10/2021
Title	Contribution to Prognostics and Health Management of Complex Systems. Application to Energy Systems
Author	AL MOHAMAD, AHMAD
Thesis Director Thesis Codirector	PUIG CAYUELA,VICENÇ HOBLOS, GHALEB
Qualification	Excel.lent

Date	29/10/2021
Title	Kinodynamic planning and control of closed-chain robotic systems
Author	BORDALBA LLABERIA,RICARD
Thesis Director Thesis Codirector	ROS GIRALT, LLUIS PORTA PLEITE, JOSE MARIA
Qualification	Excel.lent Cum Laude

Date	04/11/2021
Title	Fault diagnosis and fault-tolerant control of nonlinear dynamic systems using artificial intelligence techniques
Author	SANJUAN GÓMEZ, ADRIÁN
Thesis Director Thesis Codirector	NEJJARI AKHI-ELARAB, FATIHA SARRATE ESTRUCH,RAMON
Qualification	Excel.lent

Date	08/11/2021
Title	Mathematical modelling and advanced control design applied to high-pressure electrolyzers for hydrogen production
Author	DAVID, MARTÍN RAFAEL
Thesis Director Thesis Codirector	OCAMPO MARTINEZ,CARLOS AUGUSTO SANCHEZ PEÑA,RICARDO
Qualification	Excel.lent Cum Laude

Date	10/12/2021
Title	Design of a Hysteresis Predictive Control Strategy with Engineering Application Cases
Author	PONCE DE LEON PUIG,NUBIA ILIA
Thesis Director Thesis Codirector	RODELLAR BENEDE,JOSE JULIAN ACHO ZUPPA,LEONARDO
Qualification	Excel.lent Cum Laude

Date	10/12/2021
Title	Modeling and Control in Open-Channel Irrigation Systems
Author	CONDE MÉNDEZ, GREGORY JOHANN
Thesis Director Thesis Codirector	OCAMPO MARTINEZ,CARLOS AUGUSTO QUIJANO SILVA,NICANOR
Qualification	Excel.lent

Date	15/12/2021
Title	Control adaptativo por modelo de referencia con síntesis de controlador mínima en sistemas con incertidumbre y sujetos a perturbaciones
Author	LARCO BARROS, CIRO MAURICIO
Thesis Director Thesis Codirector	COSTA CASTELLO,RAMON OLM MIRAS, JOSEP MARIA
Qualification	Excel.lent Cum Laude

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 Joaquin Bautista Valhondo
- Dr Ernest Benedito Benet
- Dr Laia Ferrer Martí
- Dr Amaia Lusa Garcia
- Dr Rafael Pastor Moreno
- Dr Imma Ribas Vila

Doctoral data 2021

A. Program Coordinator	**AMAIA LUSA GARCIA**
B. Number of students	**12** (2021/2022)
Thesis presented in 2021:	

Date	20/12/2021
Title	Methodology for the evaluation and design of projects considering multiple criteria and uncertainty. Application to the development of energy projects in rural areas
Author	JUANPERA GALLEL, MARC
Thesis Director Thesis Directora	PASTOR MORENO, RAFAEL FERRER MARTI, LAIA
Qualification	Excel.lent Cum Laude

7. Projects and agreements

Public funding projects

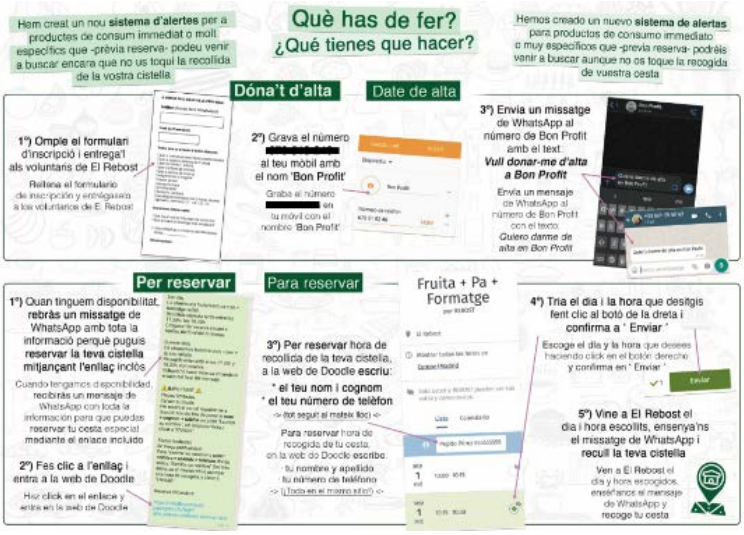
Head researcher	DOMENECH LEGA, BRUNO
Title	Desenvolupament d'eines per a l'avaluació de projectes energètics II.
Funding institution	Centre de Cooperació per al Desenvolupament
Reference	CCD-2020-B008
Start-up date	01/06/2020
Completion date	31/05/2021

Summary

The research group SCOM-UPC works since more than 10 years ago on an investigation to support rural electrification promoters in developing countries on the design of isolated projects with renewable energies. Currently, SCOM-UPC is evaluating projects implemented at different contexts, taking into account all the sustainability dimensions: techno-economic, social, environmental and institutional. The objective is to identify the strengths and weaknesses of the implemented projects, to reinforce the design tools and to improve future initiatives. This proposed focuses on Brazil, where since 2003 the “Luz para Todos” program is being promoted, one of the largest initiatives worldwide to electrify rural populations through the national grid extension, and self-sufficient projects with diesel and renewable generation. The evaluation will be carried out with a systematised multicriteria process which in addition to identify the best practices, allows extrapolating the results to other contexts in Latin America, Africa and Asia.

Head researcher	JUANPERA GALLEL, MARC
Title	Eines per l'ajuda a la presa de decisions per entitats en contextos d'economia circular i social.
Funding institution	Centre de Cooperació per al Desenvolupament de la UPC
Reference	CCD2021-H004
Start-up date	01/06/2021
Completion date	28/02/2022

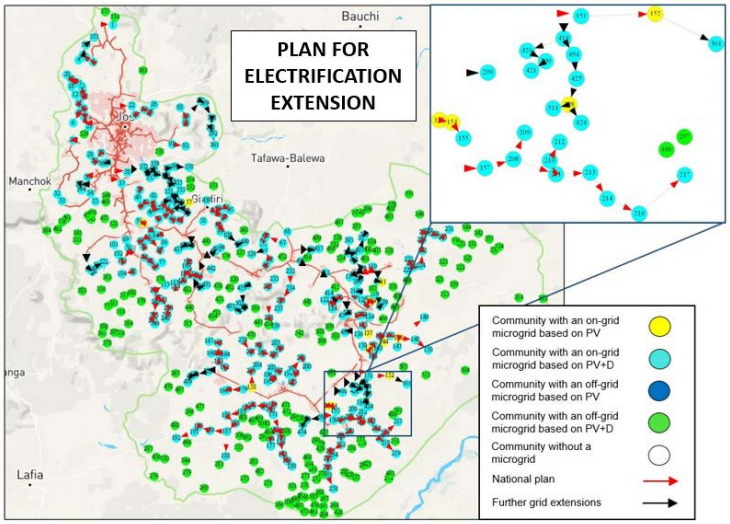
Summary



The COVID-19 pandemic is severely increasing unemployment, inequality and poverty among the most vulnerable population. At the same time, the situation of natural resources calls for a radical change in the linear model of production-consumption-waste towards circular models. There are third-sector entities committed to reducing inequalities and promoting more sustainable production-consumption models, such as Formació i Treball, which promote the work insertion of people at social exclusion risk through the collection, processing and redistribution of second-hand clothes; and El Rebost de Terrassa, aimed at the distribution of food among vulnerable populations. Often, however, these entities lack the tools and knowledge to optimize their processes. In this context, the proposed project aims to develop decision-making support tools that encourage the employment of workers and the balanced supply of clothing and food to a growing vulnerable population. The tools developed are expected to be applicable to other entities with similar models; in particular, we are already talking to other entities participating in the UPC-Mercabarna chair.

Head researcher	JUANPERA GALLEL, MARC
Title	Development of multi-criteria tools for the design of electrical systems under extreme climatic conditions in Indonesia.
Funding institution	Centre de Cooperació per al Desenvolupament
Reference	CCD-2020-B009
Start-up date	01/03/2020
Completion date	28/02/2021

Summary



The research group SCOM carries out research on rural electrification in developing countries with renewable energy since more than 10 years. From the beginning, the research focused on developing optimization and multicriteria tools to support electrification promoter in decision-making. These tools have been successfully applied in different projects. Recently, the group is expanding the research scope, aiming at adapting the optimization and multicriteria tools to new factors, such as the intensification of extreme climate phenomena (cyclons, floods, sea level rise, etc.) that affect, particularly, South-East Asia. In this context, with this application funding is requested for the trip to Indonesia, to analyze in situ the feasibility of the novel tools, complete its development through surveys to experts and future users of the systems, and perform dissemination tasks to implement them in pilot projects in the future.

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 és un projecte de formació de capacitats en educació digital dirigit a tres països llatinoamericans amb diferents necessitats i evolució en l'educació digital: Brasil, Bolívia, Cuba i deu participants de la Unió Europea.

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	PEÑA, MARTA
Title	Systemic University Change Towards Internationalisation for Academia.
Funding institution	Commission of European Communities
Reference	2019-1-PL01- KA203-065656
Start-up date	01/09/2019
Completion date	31/08/2022

Summary

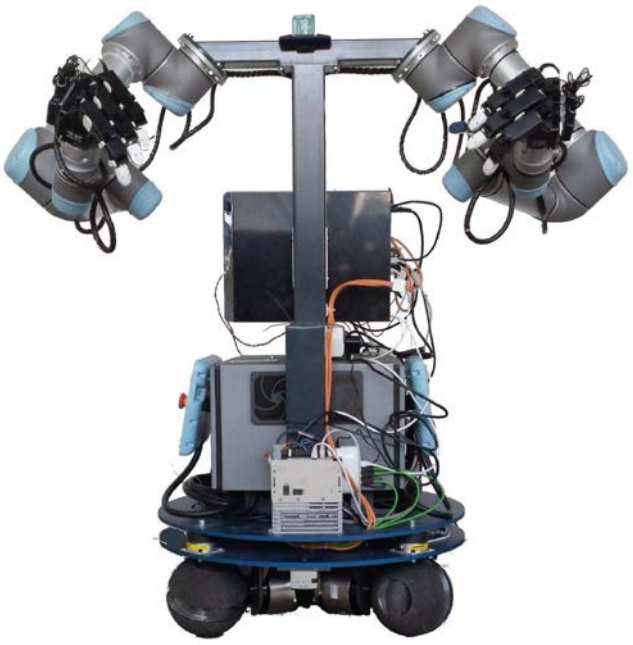
The aim of this project is to raise awareness and shift the internal culture of our institutions towards internationalization, thus creating a systemic change in our institutions and in European Higher Education. While many activities exist for internationalising students and the predecessor project SUCTI (2016-2019) concentrated on the administrative staff, SUCTI Academia (SUCTIA) aims at empowering the third pillar, the academic staff, by providing them with knowledge and skills related to their university's internationalisation process.

Investments have been made in the internationalization of this group in an attempt to increase their impact on more international research and publications, more internationalized courses, more international programs. However, in order to perform those international tasks, the academics (scholars, researchers, teachers) need to have the right preparation, training, skills and knowledge to do it properly. What is more, if they are convinced of the importance and added value of internationalisation they can become genuine change agents. In this way, they can make a key contribution to the overall objective of the project which is to transform the internal mind-set of universities and enable them to become truly internationalised institutions.

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
Control del sonido para la seguridad de la nueva generación de vehículos eléctricos. 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	FERRER MARTÍ, LAIA
Title	Optimización de Microredes con Energías Renovables bajo Incertidumbre y Futura Integración a la Red.
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 CO2 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.

In short, the aim is to have multicriteria models and tools for the design of microgrid electrification systems with renewable energy, that consider the constraints and characteristics of the promoters and future users, thus guaranteeing the efficiency and time sustainability of the obtained solutions.

Head researcher	BAUTISTA VALHONDO, JOAQUÍN
Title	Optimización de la Producción de talleres híbridos enlazados por unidades en secuencia.
Funding institution	Agencia Estatal de Investigación
Reference	PGC2018-095080-B-I00
Start-up date	01/01/2019
Completion date	30/09/2022

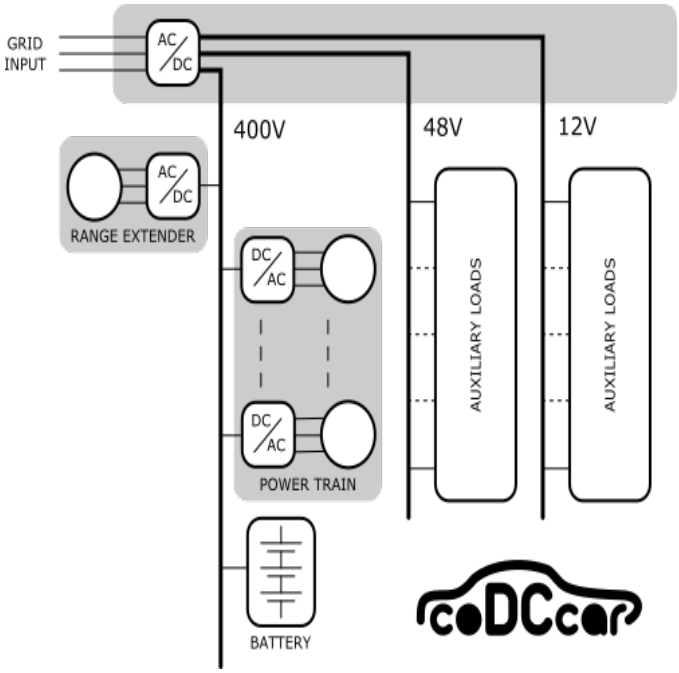
Summary

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.

Head researcher	DÒRIA-CEREZO, ARNAU / GRIÑÓ CUBERO, ROBERT
Title	Advanced control of on-board DC multibus systems in vehicles.
Funding institution	AGENCIA ESTATAL DE INVESTIGACION
Reference	DPI2017-85404-P
Start-up date	01/01/2018
Completion date	30/06/2022

Summary



In the last years two main challenges raised up in the automotive sector: for one hand, the CO2 reduction that implies a weight reduction and increasing the efficiency of the vehicle components and, for another hand, the customer's requirements, mainly, in terms of performance and security. Consequently, the use of electrified systems emerged as an alternative to be considered by the OEMs(Original Equipment Manufacturers). This new tendency does not only consider the electrification of the power train (i.e. electrical and hybrid vehicles) but is also evident in many auxiliary devices that are increasingly being electrified.
However, the major electrification of vehicles could imply problems related to on-board DC micro-grids. This implies the necessity of designing: controllers that ensure grid stability in front of the connection of constant power loads (CPLs), but also offer good robustness and efficiency properties, and optimization algorithms for the dc micro grid.

This project considers a DC multi-bus, with the most, used automotive voltages (400V, for power the train, and 48 V and 12 V, for auxiliary devices), composed by only one storage element (batteries). The dc buses will be connected by one multiport converter (400/48/12 V DC) that will also offer charger functionalities thanks to a single-phase 230 V, or tree-phase 400 V, controlled unitary power. actor rectifier. The main advantage of using only one battery and one power converter is the size and weight reduction.

The aim of this project is to study and develop control strategies for a DC multi-bus

and a multi-port power converter that provides energy management among the dc buses and AC/DC charging functionalities. During the project several control techniques will be used; resonant digital control, sliding-mode control, adaptive control, control based on systems with complex coefficients, control of complex networks and continuous optimization methods. The obtained control algorithms will be tested in the experimental plants and, the obtained results are expected to be of interest of the industrial and automotive sectors.

Keywords: Control of power electronic converters, stability and regulation, constant power loads, on-board dc networks.

Head researcher	LUSA GARCIA, AMAIA
Title	Gender Equality in Engineering through Communication and Commitment.
Funding institution	European Commission
Reference	H2020-741128-GEECCO
Start-up date	01/05/2017
Completion date	30/04/2021

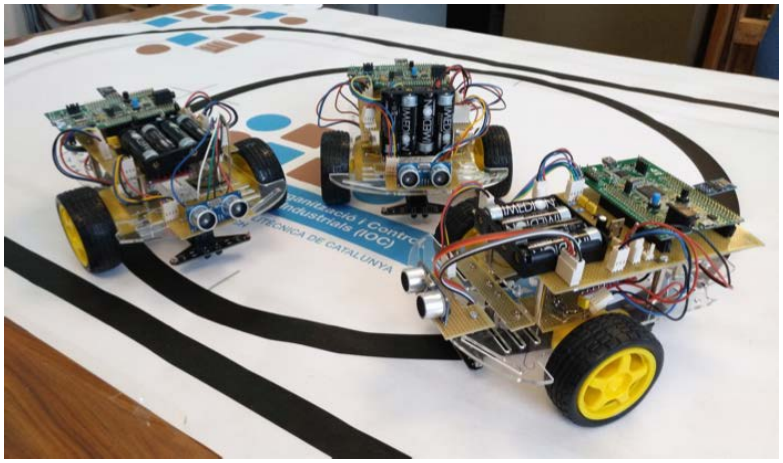
Summary

The underrepresentation of women continues to characterise the STEM field (Science, Technology, Engineering, and Mathematics). Whereas in Europe approximately half of the PhD students are female, only 21% of PhD graduates in computing and 25% of PhD graduates in engineering are women. Given the relevance of technologies in our societies an adequate participation of all genders in the STEM field is of outstanding importance. With technologies, we shape structures that have long-term impacts on how people live, work, communicate, travel, and consume. Therefore, the gender dimension in research and innovation, their contexts and their outcomes, is significant. GEECCO is an EU funded project, which brings together a consortium that is characterised by the focus on the STEM field. GEECCO will increase the number of Research Performing Organizations (RPOs) and Research Funding Organizations (RFOs) that start to implement gender equality plans (GEP) pursuing the 3 objectives mentioned in the challenge, namely: (1) Removing barriers to the recruitment, retention and career progression of female researchers; (2) Addressing gender imbalances in decision making processes; (3) Strengthening the gender dimension in research programmes. GEECCO will be a step forward to a new way of establishing tailor-made GEPs in RPOs and implementing the gender dimension in

research funding programmes. An effective and efficient dissemination and exploitation strategy has the aim of making the GEECCO approach accessible to other actors.

Head researcher	OLM MIRAS, JOSEP M.
Title	Control Avançat de Sistemes d'Energia.
Funding institution	Agència de Gestió d'Ajuts Universitaris i de Recerca
Reference	2017 SGR 872
Start-up date	01/01/2017
Completion date	30/09/2021

Summary



This project is aimed at recognizing and funding the research activities of the group Advanced Control of Energy Systems (ACES) by the Generalitat de Catalunya. Already funded in the calls SGR 2005-2008, SGR 2009-2013, and SGR 2014-2016, ACES is a multidisciplinary constituted by engineers, physicists and mathematicians belonging to Electrical Engineering, Electronics Engineering, Automatic Control, and Mathematics Departments of UPC.

The research interests of ACES are mainly focused on the modelling and control of complex systems, as well as on its application to problems related to the electrical grid (generation, conditioning, storing, and managing of electrical energy) and automotive systems. On the one side, the theoretical working lines encompass: internal model principle-based linear control; nonlinear control, including adaptive, sliding, energy-based, and complex networks control; order reduction in large-scale models; nonsmooth systems, and differentially flat systems. On the other side, the applied works deal with power electronics converters, electrical machines, power networks, control of automotive electrical components, vehicle dynamics, traffic flow analysis, cooperative driving, and fuel cells.

Head researcher	ROSELL GRATACÒS, JAN / SUÁREZ FEIJÓO, RAÚL
Title	Autonomous Dexterous Robots as Coworkers with Human Operators.
Funding institution	Ministerio de Economía, Industria y Competitividad.
Reference	DPI2016-80077-R
Start-up date	30/12/2016
Completion date	30/06/2021

Summary

The robotics field-of-application is constantly growing as the technological advances allow new capabilities and an increment and strength of the already existing ones. Among the new applications, it is worth mentioning, due to their potential significance from the productive and social point of view, those in which the robots work jointly with the humans, originating the concept of "coworker robots". In this type of applications, the robots require some special features. On the one hand, they must have certain level of autonomy and capacity of decision, as their role is no longer doing repetitive tasks in the classical way but on the contrary, they must adapt themselves with swiftness to changing conditions, especially to those produced by the humans in the same workspace. This adaptation implies an interaction with the human operators that constraint the robot movements and actions with the aim of avoiding potential injuries to humans, but without affecting the robot efficiency. In order for the coworker robots to be useful for the human operators, it is necessary that they have an important level of dexterity so that they can perform a number of different actions usually required in the human activities. In this context, the project aims for solutions that increment the performance of the coworker robots to allow their permanent establishment in our society, and, at the same time, facilitate their acceptance by the humans. With this aim, the project will deal with the topics mentioned above, developing algorithms and procedures that make easy the efficient cooperation between coworker robots and humans. Specifically, contributions are expected in relevant topics, as: the increment of the robot capability to autonomously manage the required tasks and the movements to execute them, using ontologies to represent the knowledge; the increment of the dexterous and bimanual manipulation capabilities, monitoring the movements to prevent potential failures; and the improvement of the interaction with the human operators regarding reactive, cooperative and exchange-objects movements, considering approaches based on demonstrations or

on teleoperation. All the theoretical developments will be checked and validated experimentally using the systems specifically prepared for it in the project. Besides, as usual in the developments of the group, the mentioned problems will be addressed with the intention of providing general solutions, valid for both industrial and service robotics, taking care of the productive and social components.

Agreements with companies

Head researcher	ARIAS PUJOL, ANTONI
Title	Contracto para la realización de análisis de estabilidad y diseño de algoritmos de control para convertidores de electrónica de potencia.
Funding institution	UNIVERSIDAD DEL PAIS VASCO
Reference	
Start-up date	30/10/2021
Completion date	30/06/2023

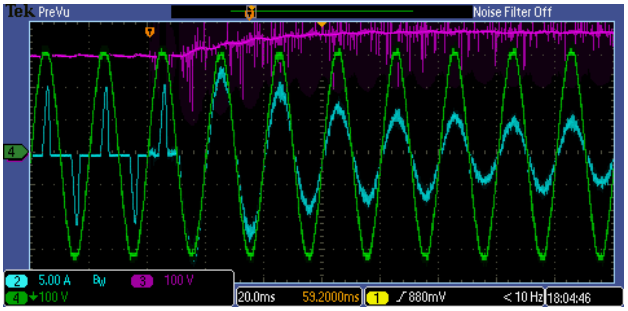
Summary

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	OLIVELLA NADAL, JORDI/BERBEGAL-MIRABENT, JASMINA/CALLEJA SANZ, GEMA
Title	Global University Entrepreneurial Spirit Students' Survey
Funding institution	Ernst & Young
Reference	
Start-up date	12/10/2020
Completion date	31/08/2022

Summary

GUESSS és un gran projecte de recerca global sobre l'emprenedoria dels estudiants. En aquestes pàgines, podeu trobar informació detallada sobre el propi projecte GUESSS, els seus objectius, les recopilacions de dades, l'estructura organitzativa, les publicacions acadèmiques i orientades als professionals, així com sobre com participar-hi.

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

Summary

Segons el conveni de col·laboració signat el 22 de setembre, a Barcelona, entre la UPC i ASEPEYO, aquesta mútua facilitarà les dades a analitzar i el seu coneixement dels riscos, mentre que la UPC, a través de l'Institut d'Organització i Control de Sistemes Industrials (IOC), desenvoluparà les anàlisis necessàries. Els estudis que es desenvoluparan se centraran en aspectes com les caracteritzacions dels accidents que ocasionen lesions greus i mortals i dels que ocasionen lesions lleus, l'estacionalitat de la sinistralitat i els factors de risc que contribueixen a l'augment de la sinistralitat, entre d'altres. Per fer aquests anàlisis, es preveu l'ús de mètodes d'Intel·ligència Artificial (IA).

Head researcher	ARIAS PUJOL, ANTONI
Title	Power Supplies Control
Funding institution	UNIVERSIDAD DEL PAIS VASCO
Reference	
Start-up date	30/10/2020
Completion date	30/06/2021

Summary

A digital control for a DC/DC 4V 1200A power supply has been designed as a prototype for the CERN particle accelerator. A novel voltage regulation approach that ensures the current balance between the paralleled Series Capacitor cells is also proposed, where one cell is responsible for the output voltage regulation, while the remaining cells are current regulated. A balanced current sharing between the Series Capacitor cells is achieved, when the current controlled cells are referenced by the actual current of the 1st one. The proposal is theoretically analysed and experimentally validated in a six cell 1000A prototype unit.

Head researcher	LUSA GARCÍA, AMAIA
Title	Suport tècnic ELIX POLYMERS
Funding institution	ITHINKUPC, S.L.
Reference	
Start-up date	20/09/2020
Completion date	10/05/2021

Summary

The main objective is the development of a tool to support planning for finished and semi-finished products, which based on MTO and MTF production strategies, and complying with established restrictions, can make the current system more efficient. To this end, the team is requested to provide the necessary advisory support for the design of the algorithm with the following characteristics: (i) incorporation of planning drivers such as inventory costs, service level and product margin; (ii) respect the current structural manufacturing constraints such as dependencies between products, plant capacities and incompatibilities of production lines; (iii) be able to simulate various planning scenarios according to drivers and constraints.

Head researcher	LUSA GARCÍA, AMAIA
Title	Formació en logística per estudiants del Tecnológico de Monterrey.
Funding institution	Instituto Tecnológico y de Estudios Superiores de Monterrey
Reference	
Start-up date	30/04/2019
Completion date	29/04/2024

Summary

The project consists in organizing and developing a summer school for students coming from the Instituto Tecnológico y de Estudios Superiores de Monterrey. All courses are focused on logistics and transportation and visits to different companies are also organized. Some trainers belong to IOC and others to other departments or organizations.

Head researcher	ESTEBAN PEÑA PITARCH
Title	Copropietat patent/'dispositivo de medida de la fuerza muscular del suelo pélvico
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).

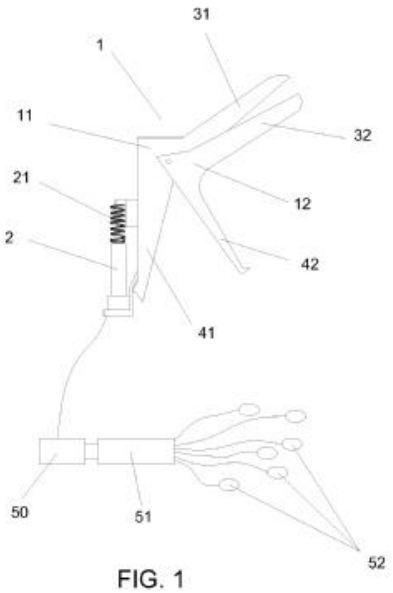


FIG. 1

8. Publications

Journals articles

1. Aguilar, H.; García-Villoria, A.; Pastor, Rafael. **Mathematical models for buffer sizing problems in parallell assembly lines with multi-line stations and different cycle times**. *Dyna*. 2021. Volum: 96. Número: 6. Pàgs: 563~563. URL: https://www.revistadyna.com/busqueda/modelos-matematicos-para-resolucion-del-problema-de-dimensionado-de-buffers-en-lineas-de-montaje-en. DOI: https://doi.org/10.6036/10223. JCR-Science Edition. FI: 2.07. Q3;

2. Aguilar, H.; Pastor, Rafael; García-Villoria, A.. **Existence and sizing of buffers in parallel assembly lines with multi-line workstations and different cycle times**. *Dyna management*. 2021. Volum: 9. Número: 1. Pàgs: 1~1. URL: https://www.dyna-management.com/search-content-2/existence-and-sizing-of-buffers-in-parallel-assembly-lines-with-multi-line-workstations-and-differen. DOI: https://doi.org/10.6036/MN10070. ERIH Plus - European Reference Index for the Humanities and Social Sciences.

3. Alcelay, J. I.; Peña-Pitarch, E.; A. Al Omar. **Hot working behaviour and processing maps of duplex cast steel**. *International journal of materials research*. 2021. Volum: 112. Número: 7. Pàgs: 518~518. URL: https://www.degruyter.com/document/doi/10.1515/ijmr-2021-8242/html. DOI: https://doi.org/10.1515/ijmr-2021-8242. JCR-Science Edition. FI: 0.678. Q4;

4. Balta, R.; Noelia Olmedo-Torre; Peña, M.; Renta-Davids, A.I.. **Academic and emotional effects of online learning during the COVID-19 pandemic on engineering students**. *Education and information technologies*. 2021. Volum: 26. Número: 6. Pàgs: 7407~7407. URL: https://link.springer.com/article/10.1007/s10639-021-10593-1. DOI: https://doi.org/10.1007/s10639-021-10593-1. JCR-Social Sciences Edition. FI: 3.666. Q1;

5. Bautista, J.. **Exact and heuristic procedures for the Heijunka-flow shop scheduling problem with minimum makespan and job replicas**. *Progress in Artificial Intelligence*. 2021. Volum: 10. Número: 4. Pàgs: 465~465. URL: https://link.springer.com/article/10.1007%2Fs13748-021-00249-z. DOI: https://doi.org/10.1007/s13748-021-00249-z. SJR - SCImago Journal Rank. FI: 0.913. Q2;

6. Bautista, J.. **Métodos de planificación y secuenciación Heijunka inspirados en el problema del reparto en sistemas electorales**. *Dirección y organización. Revista de ingeniería de organización*. 2021. Número: 73. Pàgs: 18~18. URL: https://www.revistadyo.es/DyO/index.php/dyo/article/view/590. DOI: https://doi.org/10.37610/dyo.v0i73.590. SJR - SCImago Journal Rank. FI: 0.201. Q3;

7. Bonet, C.; Jeffrey, M.; Martin, P.; Olm, Josep M.. **Ageing of an oscillator due to frequency switching**. *Communications in nonlinear science and numerical simulation*. 2021. Volum: 102. Pàgs: 105950:1~105950:1. URL: https://www.sciencedirect.com/science/article/abs/pii/S1007570421002628. DOI: https://doi.org/10.1016/j.cnsns.2021.105950. JCR-Science Edition. FI: 4.186. Q1;

8. Cantú, V.H.; Azzaro-Pantel, C.; Ponsich, A.. **A novel matheuristic based on bi-level optimization for the multi-objective design of hydrogen supply chains**. *Computers & chemical engineering*. 2021. Volum: 152. Pàgs: 107370:1~107370:1. URL: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/science/article/pii/S0098135421001484. DOI: https://doi.org/10.1016/j.compchemeng.2021.107370. JCR-Science Edition. FI: 4.13. Q2;

9. Cantú, V.H.; Azzaro-Pantel, C.; Ponsich, A.. **Constraint-handling techniques within differential evolution for solving process engineering problems**. *Applied soft computing*. 2021. Volum: 108. Pàgs: 107442:1~107442:1. URL: https://www.sciencedirect.com/science/article/abs/pii/S1568494621003653. DOI: https://doi.org/10.1016/j.asoc.2021.107442. JCR-Science Edition. FI: 8.263. Q1;

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11. Doria-Cerezo, A.; Olm, Josep M.; Biel, D.; Fossas, E., E. Fossas, E. Fossas-Colet, Enric Fossas, Enric Fossas-Colet. **Sliding modes in a class of complex-valued nonlinear systems**. *IEEE transactions on automatic control*. 2021. Volum: 66. Número: 7. Pàgs: 3355~3355. URL: https://ieeexplore.ieee.org/document/9186354. DOI: https://doi.org/10.1109/TAC.2020.3021396. JCR-Science Edition. FI: 6.549. Q1;

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Conference publications

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3. Bautista, J.. **Solving the permutation Heijunka flow shop scheduling problem with non-unit demands for jobs**. XIX Conferencia de la Asociación Española para la Inteligencia Artificial. 22/09/2021. https://caepia20-21.uma.es/proceedings.html.

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7. Domenech, B.; Ferrer-Martí, L.; García-Villoria, A.; Juanpera, M.; Pastor, Rafael. **Proyectos de electrificación rural con energías renovables para la docencia en Ingeniería**. XI Congrés Internacional de Docència Universitària i Innovació. 29/06/2021. https://www.cidui.org/wp-content/uploads/2021/06/CIDUI-2021-SP-7.pdf.

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11. Mas de les Valls, E.; Peña, M.; Noelia Olmedo-Torre; Pino, D.; Alcober, J.; Batet, L.. **Gènere i Docència en l'àmbit STEM - Treball cooperatiu per incorporar la perspectiva de gènere**. XI Congreso Internacional de Docencia Universitaria e Innovación. 08/10/2021. https://raco.cat/index.php/RevistaCIDUI/index.

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15. Rivera, M.; Fossas, E.; Angulo, F.. **Sliding control applied to a single-phase current source inverter**. 5th IEEE Colombian Conference on Automatic Control. 2021. https://ieeexplore.ieee.org/document/9633286.

16. Sanz, V.; Lopez , G.; Costa-Castelló, R.; Batlle, C.. **Combined heat and power using high-temperature proton exchange membrane fuel cells for housing facilities**. 26th IEEE International Conference on Emerging Technologies and Factory Automation. 07/09/2021. https://ieeexplore.ieee.org/document/9613460.

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Books

1. Bautista, J.. **Modelos y herramientas de decisión**. DEXTRA Editorial S.L.. 2021. ISBN/ISSN: 978-84-17946-33-3.

2. Bautista, J.. **Metaheurísticas en ingeniería**. DEXTRA Editorial S.L.. 2021. ISBN/ISSN: 978-84-17946-44-9. https://dextraeditorial.publica.la/library/filter?collection=ingenieria-de-la-organizacion.

Book chapters

1. Anich, N.; Mateo, M.. **Risk analysis in synergic supply chains**. *Risk management: an overview*. Nova Science Publishers, Inc.. 2021. Pàgs: 83 ~ 116. ISBN: 9781685071776. https://novapublishers.com/shop/risk-management-an-overview/.

2. Anich, N.; Mateo, M.. **Application of a methodology for the management of risk in a pharmaceutical supply chain**. *Organizational engineering in industry 4.0*. 2021. Pàgs: 127 ~ 136. ISBN: 978-3-030-67708-4. https://link.springer.com/chapter/10.1007/978-3-030-67708-4_14.

3. Batlle, C.; Fossas, E., **Control óptimo**. *Técnicas de optimización*. Dextra Editorial S.L.. 2021. Pàgs: 327 ~ 392. ISBN: 978-84-17946-53-1. https://www.dextraeditorial.com/comprar/207/tecnicas/optimizacion/ingenieria/la/organizacion/ingenieria/control/optimo/metaheuristica/hiperheuristicas/vectores/optimos/exploracion/arborescente/tecnicas/optimizacion/.

4. Bautista, J.. **Solving the permutation Heijunka flow shop scheduling problem with non-unit demands for jobs**. *Advances in Artificial Intelligence 19th Conference of the Spanish Association for Artificial Intelligence, CAEPIA 2020/2021, Málaga, Spain, September 22–24, 2021, Proceedings*. Springer. 2021. Pàgs: 170 ~ 181. ISBN: 978-3-030-85712-7. https://link.springer.com/book/10.1007%2F978-3-030-85713-4.

5. Lusa, A.; Domenech, B.. **Modelización de problemas de optimización**. *Técnicas de Optimización*. Dextra Editorial S.L. 2021. Pàgs: 125 ~ 174. ISBN: 978-84-17946-53-1. https://www.dextraeditorial.com/comprar/207/tecnicas/optimizacion/ingenieria/la/organizacion/ingenieria/control/optimo/metaheuristica/hiperheuristicas/vectores/optimos/exploracion/arborescente/tecnicas/optimizacion/.

6. Muñoz, Cesar-Hugo; Olivella, J.. **Enablers and inhibitors for IoT implementation**. *Internet of things cases and studies*. Springer. 2021. Pàgs: 25 ~ 48. ISBN: 978-3-030-70477-3. https://www.springerprofessional.de/en/internet-of-things/19357478.

7. Muñoz, C.; Olivella, J.. **Digital monitoring and optimization of breeding processes: an aquaculture case study**. *Lecture notes on data engineering and communications technologies. ICMSEM 2021: Proceedings of the Fifteenth International Conference on Management Science and Engineering Management.*. Springer. 2021. Pàgs: 513 ~ 529. ISBN: 978-3-030-79203-9. https://link.springer.com/chapter/10.1007/978-3-030-79203-9_40.

8. Peña-Pitarch, E.; Inmaculada Puig de la Bellacasa; Padilla-Magana, J.; A. Al Omar; Alcelay, J. I.. **Virtual human hand: wrist movements**. *Advances in simulation and digital human modeling: proceedings of the AHFE 2021 Virtual Conferences on Human Factors and Simulation, and Digital Human Modeling and Applied Optimization, July 25–29, 2021, USA*. Springer. 2021. Pàgs: 304 ~ 311. ISBN: 978-3-030-79762-1. https://link.springer.com/book/10.1007%2F978-3-030-79763-8.

9. Prizes and awards

Bautista, J.. **Primer premio al mejor trabajo: XIX Conference of the Spanish Association for Artificial Intelligence (CAEPIA) September 22-24, 2021. Malaga**. 2021. *Solving the Permutation Heijunka Flow Shop Scheduling Problem with non-unit demands for Jobs*. **Primer premi**. SIR-OPE - Service and Industrial Robotics - Operation, Production and Enterprise.

Lusa, A.; Castell, N.; Martinez, M.; Mas de les Valls, E.; Noelia Olmedo-Torre; Peña, M.. **Menció Encarna Sanahuja Yll 2021**. 2021. *Menció M. Encarna Sanahuja Yll, com a premi col·lectiu, al projecte Disseny, elaboració i disseminació de recursos per a la introducció de la perspectiva de gènere a la docència en l'àmbit STEM, de la Universitat Politècnica de Catalunya, per contribuir a avançar en la incorporació de la perspectiva de gènere tant en l'activitat acadèmica com per mitjà d'accions de suport a altres universitats, projectes europeus, jornades i cursos de formació, compartint experiències i recursos també amb el públic no especialitzat.*. **Primer premi**. SOC-STEM - Impacte Social de les STEM; CREMIT - Centre de Recerca de Motors i Instal·lacions Tèrmiques; GIOPACT - Grup de Recerca d'Igualtat d'Oportunitats per a l'Arquitectura, la Ciència i la Tecnologia.

Lusa, A.; Castell, N.; Martinez, M.; Mas de les Valls, E.; Noelia Olmedo-Torre; Peña, M.. **Premi UPC al Compromís Social 2021: Àmbit Igualtat de Gènere**. 2021. *Àmbit de la Igualtat de gènere Perspectiva de gènere a la docència en el marc del projecte GEECCO*. **Primer premi**. SOC-STEM - Impacte Social de les STEM; CREMIT - Centre de Recerca de Motors i Instal·lacions Tèrmiques; GIOPACT - Grup de Recerca d'Igualtat d'Oportunitats per a l'Arquitectura, la Ciència i la Tecnologia.

Mas de les Valls, E.; Peña, M.; Noelia Olmedo-Torre; Pino, D.; Alcober, J.; Batet, L.. **Premi AQU-CIDUI a una de les millors comunicacions oral del XI Congrés Internacional de Docència Universitària i Innovació**. 2021. *La comunicació "Gènere i Docència en l'àmbit STEM: Treball cooperatiu per incorporar la perspectiva de gènere" ha estat guardonada amb el premi AQU-CIDUI a una de les millors comunicacions oral del XI Congrés Internacional de Docència Universitària i Innovació celebrat de manera virtual els dies 29, 30 de juny, 1 i 2 de juliol de 2021.*. **Primer premi**. DF-GeoTech - Dinàmica de Fluids i Aplicacions Geofísiques i Tecnològiques; SOC-STEM - Impacte Social de les STEM; ANT - Grup de Recerca en Tecnologies Nuclears Avançades; BAMPLA - Disseny i Avaluació de Xarxes i Serveis de Banda Ampla; CREMIT - Centre de Recerca de Motors i Instal·lacions Tèrmiques.

Peña-Pitarch, E.; Inmaculada Puig de la Bellacasa; Alcelay, J. I.; Padilla-Magana, J.. **Best Paper Award. AHFE International Conference 2021**. 2021. *Premi al millor article: Applied Human Factors and Ergonomics 2021 and its Affiliated Conferences*. **Accèssit**. SIR-OPE - Service and Industrial Robotics - Operation, Production and Enterprise; TECNOFAB - Grup de Recerca en Tecnologies de Fabricació.

Rosell, J.. **Direcció de tesis guardonada amb el Premi Extraordinari de Doctorat dins l'àmbit d'Enginyeria Industrial - curs 2018-19**. 2021. *Direcció de la tesis titulada COMBINING TASK AND MOTION PLANNING FOR MOBILE MANIPULATORS realitzada per Aliakbar Akbari*. **Primer premi**. SIR-OPE - Service and Industrial Robotics - Operation, Production and Enterprise.

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

16th year

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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