PAEE ALE 2016

8TH INTERNATIONAL SYMPOSIUM ON PROJECT APPROACHES IN ENGINEERING EDUCATION

14TH ACTIVE LEARNING IN ENGINEERING EDUCATION WORKSHOP

GUIMARÃES - PORTUGAL
CENTRO CULTURAL VILA FLOR

SUSTAINABILITY IN ENGINEERING EDUCATION

06-08 JULY 2016

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PROJECT
APPROACHES
IN ENGINEERING
EDUCATION

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WELCOME TO PAEE/ALE'2016

Dear Participants,

Welcome to PAEE/ALE'2016, the 8th International Symposium on Project Approaches in Engineering Education (PAEE) and 14th Active Learning in Engineering Education Workshop (ALE). Educating engineers that will shape our future is an important task. But to be frank, in many places engineering education has a bad reputation: it is boring. The study to become an engineer is difficult and requires a lot of hard work. Engineering education is no fun. But it does not have to be that way. Engineering education can be stimulating and motivating, challenging students to solve problems from engineering practice like real professionals.

The past years PAEE and ALE have been organized in different parts of the world, aiming to enhance Active Learning, Problem and Project-Based Learning in Engineering Education through active involvement of participants in a variety of sessions, hands-on, workshops, debate sessions, industry panel, interactive poster session, paper sessions, keynote sessions and student project awards. This year is a special edition of the symposium as we continue to join forces with Project Approaches in Engineering Education (PAEE) and ALE (Active Learning in Engineering Education Network) to create opportunities for learning and networking of Engineering Education professionals who are dedicated to active learning.

The PAEE symposium is organised by the PAEE association (http://paee.dps.uminho.pt/) and the Department of Production and Systems of the University of Minho, Portugal, since 2009, and aims to join teachers, researchers and professionals concerned with Engineering Education. ALE (http://www.ale-net.org/) is an international network of engineering educators, initiated in 2000, dedicated to improving engineering education through active learning.

The theme of this year's conference - Sustainability in Engineering Education - is aligned with the location of the hosting event. The city of Guimarães is candidate for the 2020 European Green Capital Award, an excellent opportunity to discuss research and current practice under this challenging theme.

We would like to express our sincere gratitude to the participants that makes this event possible and for all the support that we had during this last year from different persons and organizations.

We hope you will enjoy the conference, the social program and your stay in Guimarães,

Rui M. Lima

Erik de Graaff

(Chairs of the PAEE/ALE'2016)

PAEE/ALE'2016 Organization

PAEE/ALE'2016 Chairs

Rui M. Lima - Department of Production and Systems - Engineering School, University of Minho

Erik de Graaff - Department of Development and Planning - Aalborg University, Denmark

PAEE/ALE'2016 Organising Committee

Rui M. Lima - Department of Production and Systems - Engineering School, University of Minho, Guimarães, Portugal

Erik de Graaff - Department of Development and Planning - Aalborg University, Denmark

Anabela Alves - Department of Production and Systems - Engineering School, University of Minho, Guimarães, Portugal

Andromeda Menezes - Department of Production and Systems - Engineering School, University of Minho, Guimarães, Portugal

Diana Mesquita - Institute of Education / Dep. Production Systems - University of Minho, Braga, Portugal

Dinis Carvalho - Department of Production and Systems - Engineering School, University of Minho, Guimarães, Portugal

Lamjed Bettaieb - Directeur ESPIRIT Ingénieur, Tunisia

Natascha van Hattum-Janssen - School of Creative Technology - Saxion University of Applied Sciences, Enschede, the Netherlands

Nélson Costa - Department of Production and Systems - Engineering School, University of Minho, Guimarães, Portugal

Rui M. Sousa - Department of Production and Systems - Engineering School, University of Minho, Guimarães, Portugal

Sandra Fernandes - Department of Psychology and Education, Portucalense University, Porto, Portugal

Valquíria Villas Boas - Centro de Ciências Exatas e Tecnologia - Universidade de Caxias do Sul, Brasil

PAEE/ALE'2016 SCIENTIFIC COMMITTEE

Scientific Committee	Affiliation
Adriana Fischer	Post-graduate Programme in Languages, Universidade Regional de Blumenau (FURB), Brazil
Aida Guerra	UNESCO Chair in PBL in Engineering Education, Department of Development & Planning, Aalborg University, Aalborg, Denmark
Ana Lúcia Manrique	Faculty of Science and Technology, PUC São Paulo, Brazil
Ana Margarida Veiga Simão	Faculty of Educational Science, University of Lisbon, Portugal
Anabela Alves	Department of Production and Systems, Engineering School, University of Minho, Guimarães, Portugal
André Fernando Uébe Mansur	Instituto Federal Fluminense e Universidade Federal Fluminense
André Luiz Aquere	Department of Civil and Environmental Engineering, Faculty of Technology, University of Brasília, Brazil
Andromeda Menezes	Department of Production and Systems, Engineering School, University of Minho, Guimarães, Portugal
Bernd M. Zunk	Institute of Business Economics and Industrial Sociology, Graz University of Technology, Austria
Bill Williams	Escola Superior de Tecnologia do Barreiro, Instituto Politécnico de Setúbal, Portugal
Celina Leão	Department of Production and Systems, Engineering School, University of Minho, Guimarães, Portugal
Ciliana Regina Colombo	Departamento de Engenharia de Produção, Centro de Tecnologia, Universidade Federal do Rio Grande do Norte, Natal, Brasil
Claisy Marinho-Araújo	Institute of Psychology, University of Brasília (UnB), Brasília, Brazil
Diana Mesquita	Institute of Education / Dep. Production Systems, University of Minho, Braga, Portugal
Diana Pereira	Institute of Education, University of Minho, Braga, Portugal
Dianne M. Viana	Department of Mechanical Engineering, Faculty of Technology, University of Brasília, Brazil
Donald D. Carpenter	Great Lakes Stormwater Management Institute, Department of Civil Engineering, Lawrence Technological University, USA
Elisabeth Saalman	Engineering Education Research, Chalmers University of Technology, Sweden
Ely A. T. Dirani	Faculty of Science and Technology, PUC São Paulo, Brazil
Erik de Graaff	Department of Development and Planning, Aalborg University, Denmark
Filomena Soares	Department of Industrial Electronics, Engineering School, University of Minho, Guimarães, Portugal
Francisco Gomes	Department of Electrical Engineering, Faculty of Technology, University of Juiz de Fora, Brazil
Francisco Moreira	Department of Production and Systems, Engineering School, University of Minho, Guimarães, Portugal
Guilherme Pereira	Department of Production and Systems, Engineering School of the University of Minho
Isabel Loureiro	Department of Production and Systems, Engineering School, University of Minho, Guimarães, Portugal
Jaime Salazar	Executive Secretary of ASIBEI, Departamento de Ingeniería Civil y Agrícola, Universidad Nacional de Colombia, Colombia
João Mello da Silva	Production Engineering, Faculty of Technology, University of Brasília, Brazil
José Carlos Reston	Academic Director, IDAAM Higher Education Institution, Manaus, Brazil
José Couto Marques	Department of Civil Engineering, Faculty og Engineering, University of Porto, Portugal
José de Souza Rodrigues	Faculdade de Engenharia de Bauru, Universidade Estadual de São Paulo (UNESP)
José Dinis-Carvalho	Department of Production and Systems, Engineering School, University of Minho, Guimarães, Portugal
José Manuel Oliveira	Higher Education Polytechnic School of Águeda, University of Aveiro, Portugal
Lamjed Bettaieb	Directeur ESPIRIT Ingénieur, Tunisia
Leidy Johanna Rendón Castrillón	Centro de Estudios y de Investigación en Biotecnología (CIBIOT), Universidad Pontificia Bolivariana
Luiz Carlos de Campos	Faculty of Science and Technology, PUC São Paulo, Brazil
Marco Antonio Pereira	Escola de Engenharia de Lorena (EEL) , Universidade de São Paulo (USP)
Margarita Enid Ramírez Carmona	Facultad de Ingeniería Química, Escuela de Ingeniería, Universidad Pontificia Bolivariana, Medellín, Colombia
Maria Assunção Flores	Institute of Education, University of Minho, Braga, Portugal
Mauricio Duque	Departamento de Ingeniería Eléctrica, Universidad de los Andes, Colombia
Michael Christie	School of Science, Education & Engineering, University of the Sunshine Coast, Australia
Miren Zubizarreta	Engineering School, Mondragon University
Mladen Radisic	Industrial Engineering and Management Department, Faculty of Technical Sciences, University of Novi Sad, Serbia
Montse Farreras	Departament d'Arquitectura de Computadors, Universitat Politècnica de Catalunya/Barcelona Tech, SPAIN
Natascha van Hattum-Janssen	School of Creative Technology, Saxion University of Applied Sciences, Enschede, the Netherlands
Nelson Costa	Department of Production and Systems, Engineering School, University of Minho, Guimarães, Portugal
Nestor Arana	Engineering School, Mondragon University, San Sebastian, Spain
Nival Nunes de Almeida	Chair of ABENGE - Associação Brasileira de Educação em Engenharia, Brazil
Octavio Mattasoglio Neto	Instituto Mauá de Tecnologia, Escola de Engenharia Mauá - São Caetano do Sul - SP - Brazil
Otilia L. Heinig	Universidade Regional de Blumenau (FURB), Blumenau, Brazil
Patricio Poblete	Escuela de Ingeniería y Ciencias, Universidad de Chile, Chile
Rui M. Lima	Department of Production and Systems, Engineering School, University of Minho, Guimarães, Portugal
Rui M. Sousa	Department of Production and Systems, Engineering School, University of Minho, Guimarães, Portugal
Sandra Fernandes	Department of Psychology and Education, Portucalense University, Porto, Portugal
Simone Borges Simão Monteiro	Department of Production Engineering, Faculty of Technology, University of Brasilia (UnB), Brasília, Brazil
Sonia Gomez Puente	Technical University of Eindhoven, The Netherlands
Stevan Stankovski	Industrial Engineering and Management Department, Faculty of Technical Sciences, University of Novi Sad, Serbia
Teresa Restivo	LAETA-INEGI, Faculty of Engineering, University of Porto, Portugal
Valquiria Villas-Boas	Centro de Ciências Exatas e Tecnologia, Universidade de Caxias do Sul, Brazil
Yesid Vélez Salazar	Facultad de Ingeniería Química, Escuela de Ingeniería, Universidad Pontificia Bolivariana, Medellín, Colombia

DONALD CARPENTER

Theme: Engaging and Motivating Students (and Faculty) Through an Active Exercise

Short bio

Donald D. Carpenter, PhD, PE, LEED AP is Professor of Civil Engineering at Lawrence Technological University in Southfield Michigan USA. He is an accredited green design professional (LEED AP) and practicing professional engineer (PE) whose expertise and research interests include engineering ethics, entrepreneurial engineering, green infrastructure, innovative stormwater best management practices (BMPs), hydraulic and hydrologic modeling. As a researcher, he has been an author on nearly 100 peer reviewed manuscripts, an investigator on over $5M USD in external funding, and a presented his research and development projects on five continents. His University appointments include serving as University Director of Assessment from 2009 to 2012 after serving as founding Director of the Center for Teaching and Learning from 2006 to 2009. He has co-developed a series of faculty development workshops to bring innovative team based problem solving into the engineering curriculum to promote the entrepreneurial mindset. Over 800 of faculty from around the world have participated in versions of this workshop and activities were featured in the past two Active Learning in Engineering Conference in Brazil and Spain. In 2014, the Kern Family Foundation named him their national Most Outstanding Faculty member for these efforts. Finally, he is a member of the Steering Committee of the Active Learning in Engineering Education network.

MICHAEL CHRISTIE

Theme: Using Flanagan's Critical Incident Technique to Improve Active Teaching and Learning in Engineering Education

Short bio

From 1999 to 2012 Michael Christie worked in Sweden, first at Chalmers University of Technology in Gothenburg, where he was in charge of a teaching and learning centre, and then from 2010 at Stockholm University, where he was Sweden's first Professor of Higher Education. During that time he has been an active member of ALE and served on the advisory committee. Michael's research is concerned with fundamental epistemological questions such as how knowledge is built and the best ways of promoting learning in engineering and higher education. He is also interested in the most pedagogical ways of using digital tools in teaching and learning. Having run courses for PhD supervisors as well as supervising and marking PhD theses, he is currently researching the most efficacious way of supporting the PhD process. His own PhD was a contact history between Aborigines and Colonists in early Victoria, 1836-1886, and he has maintained an interest in cross-cultural research. In Sweden he received substantial funding for research and development projects aimed at improving learning and teaching in Higher Education. He took up his current post at the University of the Sunshine Coast in February 2013. He is also interested in the most pedagogical ways of using digital tools in teaching and learning – see Michael's response to the question 'Does ICT affect higher education?' at: http://www.youtube.com/watch?v=mWDOER_mPXo

PAEE/ALE'2016 Hands-on sessions

An important feature of the ALE workshop is the hands-on programme. Active learning approaches are usually aimed at the increase of student involvement in learning, therefore, a hands-on session on active learning count on active involvement of its participants. Three different hands-on are scheduled, meant to enable the enhancement of active learning practice.

HANDS-ON 1 - WHAT IS THE ROLE OF GROWTH WHEN TALKING ABOUT TECHNOLOGY AND SUSTAINABILITY?

Miguel Romá and Tomás Martínez - Signals, Systems and Telecommunications group (SST), University of Alicante, Spain

In the context of engineering education, it is compulsory to make the students think about the impact that technology has in many aspects of life. We, as engineers, and our students as future engineers, must be aware of both kind and awkward effects of technology from the widest possible range of points of view. Issues like how to manage technological waste (related to programmed obsolescence), the risk of the generation of unemployment caused by the use of technology (automation and robotics), the relevance of having a strong technological industry to support our working environment, the relationship between sustainability and renewable resources…, are clear examples of aspects suitable to generate interesting debates. However, there is a key element that is commonly left apart as it derives to uncomfortable conclusions. Can we talk about sustainability avoiding thinking about the effects of economic growth? In this hands-on we will present an activity used to promote critical thinking in students about the relationship between economic growth and sustainability. We will try to present the most common thoughts when technology, energy, sustainability and growth are placed in the same bowl. If we conclude that economic growth and sustainability are not odd with each other, a pleasant landscape will be shown in front of our eyes. Notwithstanding, if we conclude that sustainability is not achievable in a growth environment, the panorama will possibly be comfortless.

HANDS-ON 2 - SUSTAINABILITY IN ENGINEERING EDUCATION

Pau Bofill, Montse Farreras - Department of Computer Architecture, UPC Barcelona Tech, Barcelona, Catalonia

This document presents a Hands-On session on Sustainability in Engineering Education. Sustainability is defined as the use of resources in such a way as to allow them to regenerate in time. Sustainability should be considered in connection with equity, so that the resource is equally available to everyone. Then several categories for analysis are defined, such as GDP growth, progress, environment or holistic so as to guide the discussion. The hands-on takes place in small groups, that are asked to write a short poster on how they would introduce the subject of sustainability in a project with their students. The learning goal is that sustainability is a holistic quality, that has to do with many dimensions at the same time.

HANDS-ON 3 - INTEGRATION OF THE MODEL BASED DESIGN – INDUSTRIAL APPROACH - FOR TEACHING ENGINEERING SCIENCE

Ascension Vizinho-Coutry - The Mathworks, Inc.

Model-Based Design (MBD) has been adopted in the past two decades by engineers and researchers. By adopting MBD the development process is centered on the system model, from requirements capture, design to implementation and test throughout the process. Using Modeling, Simulation, Automatic Code generation and Test capabilities, MBD can be applied to any project ranging from small device implementation to enterprise applications and vehicles. The French Ministry of Education is revamping the science and technology flow, starting from High-School to University levels with the integration of "Engineering" into schools. This is being done for two reasons: 1- to attract students to become engineers and 2- to reduce the gap between Educational schools and Industry by developing appropriate skills for the next generation of engineers. Engineering Sciences topics are attracting more attention and weight during evaluations and exams. French teachers are increasingly adopting MBD workflows within their courses. This workshop will present the association of the Model Based Design (MBD) and the recent French teaching Gap Analysis approach. This combination enables students not only to learn the Engineering workflow (or V-cycle) but also learn the disciplines relevant to the selected course. The main topics are: (i) Model-Based Design principles; (ii) Gap Analysis approach for teaching Sciences and Engineering; (iii) Teaching concepts through a simple problem: the design of logic of the angular position controller of a DC motor; (iv)Focus on different domains: mathematical equations describing the systems behavior and concepts relevant to engineering.

List of Authors

Row Labels	Email	Country	Affiliation	#
Abel Duarte	ajd@isep.ipp.pt	Portugal	Instituto Superior de Engenharia do Porto	26
Ádám Jenei	1111815@isep.ipp.pt	Hungary	Instituto Superior de Engenharia do Porto	13
Afranio Araujo	afranioga@gmail.com	Brazil	Universidade Federal do Rio Grande do Norte	71
Aleksandr Chuchalin	chai@tpu.ru	Russian Federation	Tomsk Polytechnic University	59
Aleksandra Bazylinska	1111344@isep.ipp.pt	Poland	Instituto Superior de Engenharia do Porto	13
Alessandro Silva	alessandrops@umc.br	Brazil	Universidade de Mogi das Cruzes	131
Alex Stojcevski	alex.stojcevski@rmit.edu.vn	Viet Nam	RMIT University	135
Alexandre Formigoni	alexandre.formigoni@fatec.sp.gov.br	Brazil	Faculdade de Tecnologia de Guarulhos - Fatec Guarulhos	149
Alfonso Herrera Jimenez	aherreraj@unal.edu.co	Colombia	Universidad Nacional de Colombia	57
Allan MacKenzie	(blank)	Canada	McMaster University	76
Ana Carla Bittencourt Reis	anacarlabr@unb.br	Brazil	University of Brasilia	91
Ana Martins	ana_pmartins@live.com.pt	Portugal	University of Minho	140
Anabela Alves	anabela@dps.uminho.pt	Portugal	University of Minho	130
				144
Andre F Uebe Mansur	andreuebe@gmail.com	Brazil	Instituto Federal Fluminense	103
André Luiz Aquere	andre@unb.br	Brazil	University of Brasilia	84
Andrea C. Santos	andreasantos@unb.br	Brazil	University of Brasilia	48
Andrea Cristina Santos	andreasantos@unb.br	Brazil	University of Brasilia	46
Andréa P. Mendonça	andrea.ifam@gmail.com	Brazil	IFAM	123
Andreia Almeida	andreia.ms.almeida@gmail.com	Portugal	Board of European Students of Technology, Porto	152
Angeline Medland	amedland@usc.edu.au	Australia	University of the Sunshine Coast	36
Anna Lyza Felipe	anna.felipe@rmit.edu.vn	Viet Nam	RMIT University	135
Anthony Fountain	1141647@isep.ipp.pt	Belgium	Instituto Superior de Engenharia do Porto	26
António Gonçalves	antoniocvbg@gmail.com	Portugal	University of Minho	140
Bartosz Kuron	1141605@isep.ipp.pt	Poland	Instituto Superior de Engenharia do Porto	26
Benedita Malheiro	mbm@isep.ipp.pt	Portugal	Instituto Superior de Engenharia do Porto	13
				26
Benedito Almeida	salomaoalmeida@uol.com.br	Brazil	Centro Universitario Salesiano de São Paulo - Unisal	147
Benedito Manoel de Almeida	salomaoalmeida@uol.com.br	Brazil	UNISAL - Centro Universitário Salesiano de São Paulo	33
Bianca Soares Lucio	bianca.soares.lucio@gmail.com	Brazil	UNISAL - Centro Salesiano de São Paulo	30
Brian Joyce	brianjyc@gmail.com	Finland	HAMK University of Applied Science	103
Caio Flavio Stettiner	caio.stettiner@fatec.sp.gov.br	Brazil	Faculdade de Tecnologia de São Paulo - Sebrae	149
Carina Bentin	1141590@isep.ipp.pt	Germany	Instituto Superior de Engenharia do Porto	26
Carlinda Leite	carlinda@fpce.up.pu	Portugal	FPCEUP	15
Carlos Alberto Valencia Hernandez	carlos.valencia@pascualbravo.edu.co	Colombia	Institución Universitaria Pascual Bravo	125
Carlos Barreira	cabarreira@fpce.uc.pt	Portugal	Faculdade de Psicologia e de Ciências da Educação - Universidade de Coimbra	55
Carlos Henrique Rocha	chrocha@unb.br	Brazil	University of Brasilia	46
				48
Carlos Sacchelli	carlos.sacchelli@gmail.com	Brazil	UFSC	23
Caroline Dominguez	carold@utad.pt	Portugal	Universidade de Trás-os-Montes e Alto Douro and CIDTFF	124
Celius Magalhaes	celiusm@gmail.com	Brazil	University of Brasilia	35
Cesar Botura	cabotura@gmail.com	Brazil	Centro Universitario Salesiano de São Paulo - Unisal	147
Chihiro Morimoto	ap5537mori@g.kumamoto-nct.ac.jp	Japan	National Institute of Technology, Kumamoto College	107
Ciliana Regina Colombo	anailicobmoloc@gmail.com	Brazil	Universidade Federal do Rio Grande do Norte	130
Claisy Marinho-Araujo	claisy@unb.br	Brazil	University of Brasilia	98
Claisy Marinho-Araújo	claisy@unb.br	Brazil	University of Brasilia	35
Claudia C. Torres	claudiatorres@ifba.edu.br	Brazil	Instituto Federal da Bahia	158
Cleginaldo Pereira de Carvalho	cleginaldopcarvalho@hotmail.com	Brazil	Centro Universitário Salesiano de São Paulo	5
Crediné Menezes	credine@inf.ufes.br	Brazil	Universidade Federal do Espírito Santo	137
Cristina Ribeiro	mcr@isep.ipp.pt	Portugal	Instituto Superior de Engenharia do Porto	13
				26
Cristina Rocha	crocha@fpce.up.pt	Portugal	FPCEUP	15
Damon Berry	damon.berry@dit.ie	Ireland	Dublin Institute of Technology	88
Dan Centea	centeadn@mcmaster.ca	Canada	McMaster University	76
				77

Row Labels	Email	Country	Affiliation	#
Daniela Pedrosa	dpedrosa@utad.pt	Portugal	Universidade de Trás-os-Montes e Alto Douro / CIDTFF	55
Danillo Vicente Silva	danillovicente@hotmail.com	Brazil	UNISAL - Centro Salesiano de São Paulo	30
Dário Silva	tomaz.dario@yahoo.com	Brazil	UNISAL	115
Diana Mesquita	diana@dps.uminho.pt	Portugal	University of Minho	73
				80
				97
				116
Diana Pereira	dianapereira@ie.uminho.pt	Portugal	University of Minho	136
Dinis Carvalho	dinis@dps.uminho.pt	Portugal	University of Minho	121
Domingos Sávio Giordani	dsgiordani@usp.br	Brazil	University of São Paulo	6
Duarte Sousa	duarte.sousa@ist.utl.pt	Portugal	Instituto Superior Técnico/DEEC/AC Energia	150
Edgar Fernandes	edgar.fernandes@tecnico.ulisboa.pt	Portugal	Instituto Superior Técnico/DEM	150
Edouard Amouroux	edouard.amouroux@rmit.edu.vn	Viet Nam	RMIT University	135
Eduardo Ianaguivara	eduardo_seige@hotmail.com	Brazil	Universidade de Mogi das Cruzes	131
Elisabeth Saalman	saalman@chalmers.se	Sweden	Chalmers University of Technology	42
Elisângela De Jesus Cândido Moraes	elisangela.moraes@usp.br	Brazil	University of São Paulo	6
Elizabeth L G Siqueira	bethlandim99@gmail.com	Brazil	Insitutos Superiores de Ensino do CENSA	103
Elon Lopes Da Silva	elonlopes@hotmail.com	Brazil	UEPA - Universidade do Estado do Pará	4
Elsje Londers	elsje.londers@eng.kuleuven.be	Belgium	Faculty of Engineering Science at KU Leuven	108
Esly C. M. Silva	eslymarinho@ifba.edu.br	Brazil	Instituto Federal da Bahia	158
Eughan Davies	1141649@isep.ipp.pt	United Kingdom	Instituto Superior de Engenharia do Porto	26
Fabio Orfali	fabioo1@insper.edu.br	Brazil	Insper	122
Fares Ben Amara	fares.benamara@esprit.tn	Tunisia	ESPRIT	54
Fátima Monteiro	fatcmont@gmail.com	Portugal	ISEC - IPC	15
Fátima Montemor	mfmontemor@tecnico.ulisboa.pt	Portugal	Instituto Superior Técnico/DEQ	150
Fernando Bernardi Souza	fbernardi@feb.unesp.br	Brazil	UNESP	32
Fernando Ferreira	fjf@isep.ipp.pt	Portugal	Instituto Superior de Engenharia do Porto	26
Fernando Rodriguez	fjrodriguezm@unal.edu.co	Colombia	Universidad Nacional	113
Filipa Barros	marianabarros1994@gmail.com	Portugal	University of Minho	140
Filipe Santos	filipehssantos@gmail.com	Brazil	University of Brasilia	84
Francisca Ribeiro	ple_grupo_3@sapo.pt	Portugal	University of Minho	143
Francisco Hernández Vázquez Mellado	francisco.hernandez@correo.uady.mx	Mexico	Universidad Autónoma de Yucatán	51
				93
Francisco Ramires	fdsramires@gmail.com	Portugal	University of Minho	144
Frank Duignan	frank.duignan@dit.ie	Ireland	Dublin Institute of Technology	88
Gabriella Alves	gabriella.marialves@hotmail.com	Brazil	UNISAL	115
Geysa Carvalho Losovoi	geysalosovoi@yahoo.com.br	Brazil	Instituto Mauá de Tecnologia	97
Ghazi Abdelkader Khodjet El Khil	ghazi.khodjetelkhil@esprit.tn	Tunisia	ESPRIT	111
Gokul Thirunavukkarasu	gthiruna@deakin.edu.au	Australia	Deakin University	19
Gonçalo Cruz	goncaloc@utad.pt	Portugal	Universidade de Trás-os-Montes e Alto Douro and INESC TEC	124
Gonzalo Fernández	gonzalo.fernandez@universidadeuropea.es	Spain	Universidad Europea de Madrid	146
Graham Young	gyoung1@usc.edu.au	Australia	University of the Sunshine Coast	36
Greg Zilberbrant	(blank)	Canada	McMaster University	76
Grzegorz Jodlowski	jodlowsk@agh.edu.pl	Poland	AGH University of Science and Technology	134
Guy Littlefair	guy.littlefair@deakin.edu.au	Australia	Deakin University	19
Hector Bosso	hbosso@outlook.com	Brazil	Pontifical Catholic University of São Paulo	45
Henrique Sampaio	henrique.sampaio@lo.unisal.br	Brazil	Centro Universitario Salesiano de São Paulo - Unisal	147
Hernán Gustavo Cortés Mora	hgcortesm@unal.edu.co	Colombia	Universidad Nacional de Colombia	56
				57
Hideaki Aburatani	abura@apps.kct.ac.jp	Japan	National Institute of Technology, Kitakyushu College	151
Hikari Mitsuta	ac1593mits@g.kumamoto-nct.ac.jp	Japan	National Institute of Technology, Kumamoto College	107
Ignacio Irigaray	irigaray@fing.edu.uy	Uruguay	Facultad de Ingenieria - Universidad de la Republica	47
Ileana Monsreal Barrera	ileana.monsreal@correo.uady.mx	Mexico	Universidad Autónoma de Yucatán	93
Ilona Verwaal	i.verwaal@fontys.nl	Netherlands	Fontys UAS - Objexlab	141
Inês Vilas Boas	ines.martinezvb@gmail.com	Portugal	University of Minho	140
Inge Van Hemelrijck	inge.vanhemelrijck@eng.kuleuven.be	Belgium	Faculty of Engineering Science at KU Leuven	108
Isolda Gianni de Lima	iglima1@gmail.com	Brazil	Universidade de Caxias do Sul	156
Iván Hilliard	ivanoliver.hilliard@universidadeuropea.es	Spain	Universidad Europea de Madrid	146

Row Labels	Email	Country	Affiliation	#
Ivete Booth	iasbooth@ucs.br	Brazil	UCS	116
Jacek Kalina	jacek.kalina@polsl.pl	Poland	Silesian University of Technology	117
Jacqueline Asscher	jasscher@inter.net.il	Israel	Kinneret College	106
Jan Frick	janfrick@me.com	Norway	University of Stavanger	110
Jens Myrup Pedersen	jens@es.aau.dk	Denmark	Aalborg University, Dept. of Electronic Systems	110
Jesús Escalante Euán	jesus.escalante@correo.uady.mx	Mexico	Universidad Autónoma de Yucatán	51
				93
Jimena Arruti	jarruti@fing.edu.uy	Uruguay	Facultad de Ingeniería - Universidad de la República - Uruguay	47
Joanna Walczak	1111818@isep.ipp.pt	Poland	Instituto Superior de Engenharia do Porto	13
João Carlos Félix Souza	jocafs@unb.br	Brazil	University of Brasilia	46
				48
				91
João Mello da Silva	joaomello@unb.br	Brazil	University of Brasilia	46
				48
				91
João Nobre	joaoandrenobre@gmail.com	Portugal	University of Minho	143
João Roberto Maiellaro	joaomaiellaro@yahoo.com.br	Brazil	Faculdade de Tecnologia de Guarulhos - Fatec Guarulhos	149
Jonatan Hans Tovar Rodriguez	jhtovarr@unal.edu.co	Colombia	Universidad Nacional de Colombia	56
Jorge Matos	jorge.matos@tecnico.ulisboa.pt	Portugal	Instituto Superior Técnico/DECivil	150
Jorge Muniz Junior	jorge86056@gmail.com	Brazil	FEG/UNESP	32
	jorgemuniz@feg.unesp.br	Brazil	UNESP - Universidade Estadual Paulista	30
				33
José Cravino	jcravino@utad.pt	Portugal	Universidade de Trás-os-Montes e Alto Douro / CIDTFF	55
José de Souza Rodrigues	jsrod@feb.unesp.br	Brazil	FEB/UNESP	32
				50
José Dinis-Carvalho	dinis@dps.uminho.pt	Portugal	University of Minho	143
José Falcão de Campos	falcao.campos@tecnico.ulisboa.pt	Portugal	Instituto Superior Técnico/DEM	150
José Lourenço	lourencojr.jose@gmail.com	Brazil	UNISAL	115
Jose Lourenço Junior	lourencojr.jose@gmail.com	Brazil	Centro Universitario Salesiano de São Paulo - Unisal	147
José Rodrigues	ze_braga_pedro@hotmail.com	Portugal	University of Minho	140
José-Ismael Peña-Reyes	jipenar@unal.edu.co	Colombia	Universidad Nacional de Colombia	56
				57
				113
Joselito Chagas	joselito.moreira.chagas@gmail.com	Brazil	UNISAL - Lorena	28
Józef Pastuszka	jozef.pastuszka@polsl.pl	Poland	Silesian University of Technology	102
Juan Carlos Espinosa Moreno	jucespinosamo@unal.edu.co	Colombia	Universidad Nacional de Colombia	56
Kaouther Louati	kaouther.louati@esprit.tn	Tunisia	ESPRIT	111
Karen Lemmel Vélez	karen.lemmel@pascualbravo.edu.co	Colombia	Institución Universitaria Pascual Bravo	125
Karine Borges Oliveira	karineborges.eng@gmail.com	Brazil	UNISAL - Centro Salesiano de São Paulo	30
Karol Sztekler	sztekler@agh.edu.pl	Poland	AGH University of Science and Technology	134
Kátia Lívia Zambon	katia@feb.unesp.br	Brazil	CTI/FEB/UNESP	32
Kátia Zambom	katia@feb.unesp.br	Brazil	CTI/FEB/UNESP	50
Kelen Silva	lkelen.silva@hotmail.com	Brazil	UFSC	23
Kerry Rutter	KRutter@usc.edu.au	Andorra	University of the Sunshine Coast	36
Klaus Wuersig	wuersig@pitt.edu	United States	University of Pittsburgh at Bradford	153
Kristjan Suits	1141655@isep.ipp.pt	Estonia	Instituto Superior de Engenharia do Porto	26
Krzysztof Pikon	krzysztof.pikon@polsl.pl	Poland	Silesian University of Technology	101
				102
				105
Kurt Amann	kpereira@fei.edu.br	Brazil	Centro Universitário da FEI	145
Kyohei Kuroda	kkuroda@kct.ac.jp	Japan	National Institute of Technology, Kitakyushu College	151
Lars Uppvall	lars.uppvall@indek.kth.se	Sweden	KTH	90
Laurete Zanol Sauer	lzsauer@ucs.br	Brazil	Universidade de Caxias do Sul	156
Lea Mank	l.mank@atenekom.eu	Germany	Atene KOM	110
Lea Paz Da Silva	leapazsilva@gmail.com	Brazil	UNINOVE - Universidade Nove de Julho	87
Leonel Morgado	leonel.morgado@gmail.com	Portugal	INESC TEC / Universidade Aberta	55
Liane Ludwig Loder	lianeludwig@gmail.com	Brazil	Federal University of Rio Grande do Sul	148
Liliana Silva	liliana.ds.silva@gmail.com	Portugal	University of Minho	143
Luciano Soares	lpsoares@gmail.com	Brazil	Insper	122
Lucio Veraldo Jr	lucioveraldo@gmail.com	Brazil	UNISAL - Centro Salesiano de São Paulo	30
Lucio Veraldo Junior	lucioveraldo@gmail.com	Brazil	UNISAL - Centro Universitário Salesiano de São Paulo	33
Lucyna Czarnowska	lczarnowska@polsl.pl	Poland	Silesian University of Technology	118

Row Labels	Email	Country	Affiliation	#
Luís Lima	lul@isep.ipp.pt	Portugal	Instituto Superior de Engenharia do Porto	26
Luiz Carlos de Campos	lccampos@pucsp.br	Brazil	Pontificia Universidade Católica de São Paulo	131
			PUC-SP - Pontifícia Universidade Católica de São Paulo	87
M. Şükrü Kuran	sukru.kuran@agu.edu.tr	Turkey	Abdullah Gul University	110
Magdalena Bogacka	magdalena.bogacka@polsl.pl	Poland	Silesian University of Technology	101
				105
Makoto Ichitubo	ichitubo@vos.nagaokaut.ac.jp	Japan	Nagaoka University of Technology	151
Malcolm Campbell	malcolm.campbell@deakin.edu.au	Australia	Deakin University	14
Manuel Silva	mss@isep.ipp.pt	Portugal	Instituto Superior de Engenharia do Porto-IPP and INESC TEC ROBIS	13
Marcelo Furtado	mfurtado@unb.br	Brazil	University of Brasilia	35
Marcia Longen Zindel	marcialz@unb.br	Brazil	University of Brasilia	46
Marco Pereira	marcopereira@usp.br	Brazil	USP	65
				66
Marcos Antonio Maia de Oliveira	marcos.maia@fatec.sp.gov.br	Brazil	Faculdade de Tecnologia de Guarulhos - Fatec Guarulhos	149
Marcos G. Ghislandi	ghislandi@gmail.com	Brazil	Universidade Federal Rural de Pernambuco (UFRPE)	73
Margarita Gomez	mgomez@pequenoscientificos.org	Colombia	Universidad de Los Andes	155
Maria Araujo	valeriaaraujoufrn@gmail.com	Brazil	Universidade Federal do Rio Grande do Norte	71
Maria Assunção Flores	aflores@ie.uminho.pt	Portugal	University of Minho	80
				136
			Instituto de Educação, University of Minho	139
Maria Barreto	maribarreto@usp.br	Brazil	Universidade de São Paulo	66
Maria Brito	belmedeiros@gmail.com	Brazil	Universidade Federal do Rio Grande do Norte	71
Maria Conceição Amorim	ceca1977@gmail.com	Brazil	UFPE	73
Maria Cristina V Biazus	mcbiazus@gmail.com	Brazil	Universidade Federal do Rio Grande do Sul	103
Maria Olga Bernaldo	olgabernaldo@hotmail.com	Spain	Universidad Europea de Madrid	146
Mariana De Toledo Marinho	mariana.tmarinho@gmail.com	Brazil	FC/UNESP	32
Mariana Marinho	mariana.tmarinho@gmail.com	Brazil	FC/UNESP	50
Mariana Martins	msocm97@gmail.com	Portugal	University of Minho	144
Mariana Masteling	mariana.masteling@bestporto.org	Portugal	Board of European Students of Technology, Porto	152
Mariana Sousa	mariana.sousa@bestporto.org	Portugal	Board of European Students of Technology, Porto	152
Marina Pazeti	marina.p@alunos.eel.usp.br	Brazil	USP	65
Marjolijn Burman	marjolijn.burman@eng.kuleuven.be	Belgium	Faculty of Engineering Science at KU Leuven	108
Marta Abrantes	marta.abrantes@tecnico.ulisboa.pt	Portugal	Instituto Superior Técnico	150
Marta Cortesão	marta.cortesao@bestporto.org	Portugal	Board of European Students of Technology, Porto	152
Marta Wojcik	mwojcik@agh.edu.pl	Poland	AGH University of Science and Technology	134
Martín Tarragona	tarragona@fing.edu.uy	Uruguay	Universidad de la República	47
Maureen O'Neill	moneill@usc.edu.au	Australia	University of the Sunshine Coast	36
Mauricio Duque	ismaduque@mac.com	Colombia	Universidad de Los Andes	155
Mauro Rabelo	tunoluiz@gmail.com	Brazil	University of Brasilia	35
				98
Mayara Mantovani	mayaramantovani@yahoo.com.br	Brazil	UNISAL	115
Meriem Ben Aissa	meriem.benaissa@esprit.tn	Tunisia	ESPRIT	111
Messias Borges Silva	messias@dequi.eel.usp.br	Brazil	USP - Universidade de São Paulo	30
				33
Michaël Canu	m.canu134@uniandes.edu.co	Colombia	Universidad de Los Andes	155
Michael Christie	michael.christie@usc.edu.au	Australia	University of the Sunshine Coast	17
	michael@cwrite.net	Australia	University of the Sunshine Coast	36
				37
Midori Pitanga	midori.pitanga@lo.unisal.br	Brazil	UNISAL	115
Miguel Cunha	mnbcunha@gmail.com	Portugal	University of Porto	144
Miguel Romá	miguel.roma@ua.es	Spain	University of Alicante	78
Milton Francisco de Brito	britomf@uol.com.br	Brazil	Faculdade de Tecnologia de Guarulhos - Fatec Guarulhos	149
Miriam Chan Pavón	cpavon@correo.uady.mx	Mexico	Universidad Autónoma de Yucatán	51
Misuzu Okada	okada@kct.ac.jp	Japan	National Institute of Technology, Kitakyushu College	151
Moein Mehrtash	mehrtam@mcmaster.ca	Canada	McMaster University	77
Monika Czop	monika.czop@polsl.pl	Poland	Silesian University of Technology	102
Monique G. Bastos	monique.bastos@gmail.com	Brazil	IFAM	123
Montse Farreras	mfarrera@ac.upc.edu	Spain	UPC Barcelona	95

Row Labels	Email	Country	Affiliation	#
Mylla Ciciliano	myllamc@hotmail.com	Brazil	Instituto Mauá de Tecnologia	97
				100
Natalia Daneikina	mischenko@tpu.ru	Russian Federation	Tomsk Polytechnic University	59
Natascha Van Hattum-Janssen	n.vanhattum@saxion.nl	Netherlands	Saxion University of Applied Sciences	89
Nathally Macedo	Nathallyd3@gmail.com	Brazil	Instituto Mauá de Tecnologia	94
Nele Rumler	nele.rumler@hs-ruhrwest.de	Germany	University of Applied Sciences Ruhr West	18
Nicholas Santos	nicholas.delf@gmail.com	Brazil	UNISAL	115
Nidia Caetano	nsc@isep.ipp.pt	Portugal	Instituto Superior de Engenharia do Porto	13
Nuno Dourado	nunodourado@dem.uminho.pt	Portugal	Escola de Engenharia, University of Minho	139
Octavio Mattasoglio	omattasoglio@uol.com.br	Brazil	CEUN IMT - Escola de Engenharia Mauá	97
			Instituto Mauá de Tecnologia	94
				100
Pablo Zinemanas	zinehh@gmail.com	Uruguay	Facultad de Ingeniería - Udelar	47
Paloma Fernandéz de Toro Ronda	1141657@isep.ipp.pt	Spain	Instituto Superior de Engenharia do Porto	26
Pär Blomkvist	par.blomkvist@indek.kth.se	Sweden	KTH	90
Parminder Singh Badwal	pbadwal@deakin.edu.au	Australia	Deakin University	19
Patrícia Santos	patricia.santos@ie.uminho.pt	Portugal	Instituto de Educação, University of Minho	139
Pau Bofill	pau@ac.upc.edu	Spain	UPC	95
Paulina Achurra	paulina.achurra@insper.edu.br	Brazil	Insper	122
Paulo Ferreira	paf@keeh.net	Portugal	Instituto Superior de Engenharia do Porto	13
				26
Paulo Flores	pflores@dem.uminho.pt	Portugal	Escola de Engenharia, University of Minho	139
Paulo Ramirez	pramirez@uol.com.br	Brazil	Instituto Federal de São Paulo	149
Pedro Araújo	pedroaraujo_94@hotmail.com	Portugal	University of Minho	140
Pedro Guedes	pbg@isep.ipp.pt	Portugal	Instituto Superior de Engenharia do Porto	13
				26
Renata Chagas	renataperrenoud@hotmail.com	Brazil	Centro Universitário Salesiano - Campus Lorena	27
Renato Campos	rcampos@feb.unesp.br	Brazil	FEB/UNESP	32
Renatos Martins Das Neves	neves@ufpa.br	Brazil	UFPA - Universidade Federal do Pará	4
Ricardo Abdoel	r.abdoel@fontys.nl	Netherlands	Fontys UAS - Objexlab	141
Rita Faria	rita.faria@bestporto.org	Portugal	Board of European Students of Technology, Porto	152
Robson Santos	robson@fatec.sp.gov.br	Brazil	Faculdade de Tecnologia de Guarulhos - Fatec Guarulhos	149
Rosalie van Baest	r.vanbaest@fontys.nl	Netherlands	Fontys Hogescholen Eindhoven	22
Rosane Aragón	rosane.aragon@gmail.com	Brazil	Universidade Federal do Rio Grande do Sul	137
Rui Baía	rui.baia94@gmail.com	Portugal	University of Minho	140
Rui M. Lima	rml@dps.uminho.pt	Portugal	University of Minho	73
				80
				97
				116
				140
Rui Pereira	rmp@math.uminho.pt	Portugal	Escola de Ciências, University of Minho	139
Sacha Tournier-Pelle	s.n.tournier@saxion.nl	Netherlands	Saxion University of Applied Sciences	89
Sadayuki Shimoda	shimo@kumamoto-nct.ac.jp	Japan	National Institute of Technology, Kumamoto College	107
Samuel Tavares	samueltavares@yahoo.com	Brazil	UNINOVE - Universidade Nove de Julho	87
Sander Küttis	1111823@isep.ipp.pt	Estonia	Instituto Superior de Engenharia do Porto	13
Sandra Fernandes	sandraf@upt.pt	Portugal	Portucalense University	121
Setsuko Isoda	isodas@kumamoto-nct.ac.jp	Japan	National Institute of Technology, Kumamoto College	107
Shannon Chance	shannonchance7@gmail.com	Ireland	Dublin Institute of Technology	88
Shigeyoshi Nakamura	snakamura@kct.ac.jp	Japan	National Institute of Technology, Kitakyushu College	151
Shinya Maki	maki@vos.nagaokaut.ac.jp	Japan	Nagaoka University of Technology	151
Sidnei Silva E Silva	sidnei-abu@hotmail.com	Brazil	UEPA - Universidade do Estado do Pará	4
Simone Borges Simão Monteiro	simoneborges@unb.br	Brazil	University of Brasilia	46
				48
				84
				91
Sivachandran Chandrasekaran	siva.chandrasekaran@deakin.edu.au	Australia	Deakin University	19
Solange D. S. Alves	sdalves@ifba.edu.br	Brazil	Instituto Federal da Bahia	158
Stuart Palmer	spalm@deakin.edu.au	Australia	Deakin University	1
				2
				14
Susanne Staude	susanne.staude@hs-ruhrwest.de	Germany	University of Applied Sciences Ruhr West	18
Susie Cristine Keller	susie.keller@ufsc.br	Brazil	UFSC	23
Takashi Yamaguchi	ecoya@vos.nagaokaut.ac.jp	Japan	Nagaoka University of Technology	151
Tatiana Renata Garcia	tatiana.rgarcia@gmail.com	Brazil	UFSC	23

Row Labels	Email	Country	Affiliation	#
Ted Burke	ted.burke@dit.ie	Ireland	Dublin Institute of Technology	88
Terry Lucke	tlucke@usc.edu.au	Australia	University of the Sunshine Coast	17
				37
Thanh Chi Pham	thanh.pham@rmit.edu.vn	Viet Nam	RMIT University	135
Tiago Pereira	tmiguelpereira@hotmail.com	Portugal	University of Minho	140
Timber Yuen	timber@mcmaster.ca	Canada	McMaster University	77
Tomás Martínez	tomas@dfists.ua.es	Spain	Univerity of Alicante	78
Valquiria Villas-Boas	vvillasboas@yahoo.com	Brazil	University of Caxias do Sul	116
Vasco Areias	vascoareias9@gmail.com	Portugal	University of Minho	140
Vitor William Batista Martins	vitor_engenharia@hotmail.com	Brazil	UEPA - Universidade do Estado do Pará	4
Walid Ayari	walid.ayari@esprit.tn	Tunisia	ESPRIT	54
Waydja C. C. Correia	waydja.correia@yahoo.com.br	Brazil	Universidade Federal Rural de Pernambuco (UFRPE)	73
Wayne Hall	w.hall@griffith.edu.au	Australia	Griffith University	1
William Bergqvist	wber@kth.se	Sweden	KTH	90
Yolande Berbers	yolande.berbers@eng.kuleuven.be	Belgium	Faculty of Engineering Science at KU Leuven	108
Yury Daneykin	daneykin@tpu.ru	Russian Federation	Tomsk Polytechnic University	59
Zbigniew Żmudka	zbigniew.zmudka@polsl.pl	Poland	Silesian University of Technology	118
Zied Alaya	zied.alaya@esprit.tn	Tunisia	ESPRIT	111
Erik De Graaff	degraaff@plan.aau.dk	Denmark	Aalborg University	69