

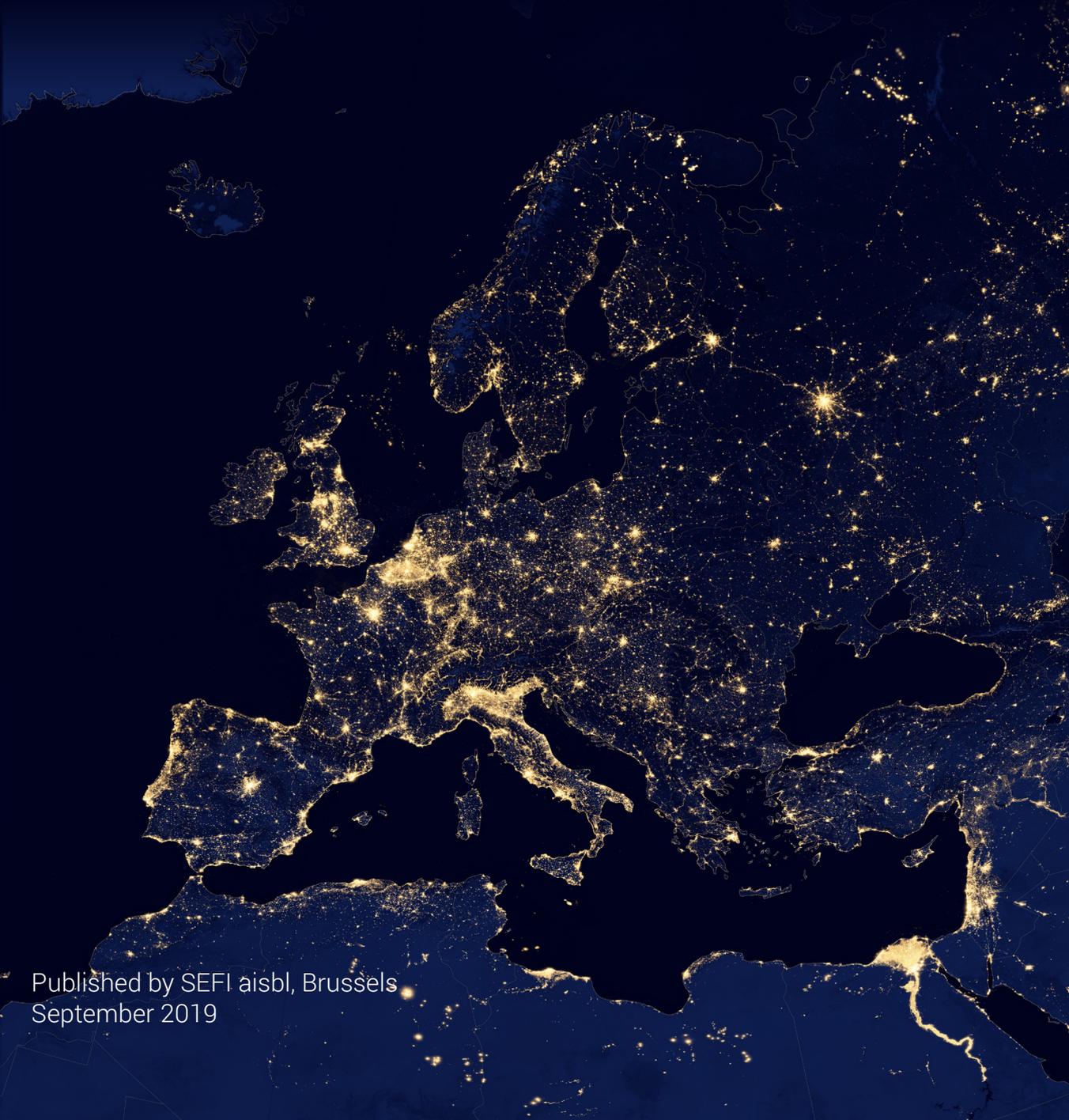


European Society for Engineering Education
Europäische Gesellschaft für Ingenieur-Ausbildung
Société Européenne pour la Formation des Ingénieurs

Diversity as an answer to ever more complex world

SEFI Annual Report 2018-2019

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September 2019





SEFI 2020 Annual Conference “Engaging Engineering Education”

20-24 September 2020 - University of Twente, Enschede, The Netherlands

Engaging a growing group of young people to embark on an engineering career is what we aim for. We share our passion to make the best of engineering education. By nature we engage with society, designing new solutions and helping to solve complex problems.

New interdisciplinary opportunities arise when engaging with other domains. Engagement of businesses and organisations helps to prepare our students for their future career.

- Mathematics and physics for engineers
- Lifelong learning, continuing engineering education
- Open & online: MOOCs, virtual reality, flipped classroom, blended learning
- Business & Universities, internships, career preparation
- Gender and diversity
- Sustainability in engineering education
- Quality Assurance and Accreditation
- Ethics in engineering education
- Engineering Education Research
- Engineering at primary and secondary schools
- Interdisciplinarity within and beyond engineering
- Innovative teaching methods, maker projects, creative learning spaces
- Gaming, competitions & challenges
- Future engineering education scenarios
- Curriculum design
- Recruitment and retention of students



European Convention for Engineering Deans University Leadership Dialog 2020

2-4 April 2020 - University Carlos III, Madrid, Spain

Save the date for the 12th SEFI Deans' Convention.

The objective of the ECED conventions is to bring together deans, presidents and directors from leading engineering institutions in Europe for in-depth discussion on contemporary challenges involved with engineering education. Over the past editions, the annual ECED conventions were attended by around 100 participants from all over Europe.



Foreword

Diversity forever!



The year 2018-2019 was another successful one in SEFI's history. We have now a relatively stable membership, and we enthusiastically welcomed new institutional, individual, associate and corporate members. This is undoubtedly a consequence of all the efforts deployed by certain of our members and by our managerial team in Brussels, but it is also due to our extremely diverse and permanently increasing activities: our regular activities, well-known by all, such as our special interest groups (WGs) and committees dealing with specific aspects of engineering education and which have been involved this year again in new EU ERASMUS + challenging projects, but also our new interesting challenges such as the support to WFEO/UNESCO for the creation of a World Engineering Day for Sustainability to be celebrated on 4 March every year (in the context of the UN SDGs) or our participation in the higher education stakeholders group, initiated by EUA and aiming to advocate for a consequent increase of the EU budget allocated to research and innovation (and therefore education) through a Call circulated at European level and EU political circles prior to the Innovation Days to be held in Brussels next September and latterly the meeting of the EU finance ministers in November. It seems reasonable to admit that more and more, our Society will have to define and take clear and strong positions on special aspects of higher (engineering) education in Europe and in the World, and to make its voice heard.

In this context, we also agreed to support a series of new education (ERASMUS+) and research (HORIZON 2020) projects in various fields such gender equality (in cooperation with TU Dublin or with EWORA), blended-learning (with University of Cadiz), transforming pedagogy (University Paris Seine), European University of Technology (UT Compiègne) or a new Knowledge Alliance "E4E" in the context of our participation in the Engineers Europe Advisory Group (EEAG-FEANI). Founded in September 2018, EEAG was signed by representatives of EE stakeholders (Engineering bodies, industry, academic and business associations) who want to align their voices and therefore constitute a fruitful ground for actions aiming in fostering stronger relations between academia, profession and industry including STEM, reinforcing the branding of the engineering profession and increasing its visibility and emphasizing the digital dimension as a common denominator connecting these areas.

Our participation in all these new activities, provided that they are supported by the EU, should have a positive impact on our Society as well. Obviously, we are facing a multi facets changing environment and we are all looking forward how to envisage and adapt to these changes, sometimes unthinkable to conceive at this stage. This new operating environment also means sometimes changing our Society as such enabling it to remain resistant and adaptable to any kind of changes, whilst maintaining its specificities and respecting its values which have guaranteed that after 46 years of existence, SEFI, as a non-profit making organisation, has succeeded to remain strong and influential.

Nonetheless, being by definition a European cooperation network, we have to admit that over the years, our presence overseas has drastically increased. Presently we are engaged in joint projects with the ASEE on issues such as credit transfer and gender and diversity, with China, if we signed a MoU with CSEE, we always maintain particular contacts with the University of Tsinghua and its CEE UNESCO Chair from which I am myself member of the Governing Board. Cooperation with Australia is also on going, whilst maintaining excellent relations with our longstanding partner associations from Central and South America or with umbrella organisations such as IFEEES and GEDC.

You will read in this issue what we are doing in terms of EU cooperation projects (A-STEP 2030, PREFER, EBCC), about our memorable annual conference 2018 held in Lyngby and forcefully organised by our past President Vigild, about our fantastic 11th Deans Convention organised by KU Leuven and whose next edition will be held in Madrid (University Carlos III) next April.

Diversity, as a solution for our complex world and its always demanding new challenges, is the general topic of this report. Indeed, in SEFI we believe in diversity since our establishment in 1973 by those who together with the Fathers of Europe founded our Society. I am not sure that at the time they had imagined that 46 years later, we would still be there. Since then, diversity has been considered on different modes: the diversity of the engineering institutions welcomed in our community, the diversity of teaching and learning, the diversity of students and academics, diversity in terms of new environment, new skills and competences. European Engineering Education diversity was THE raison d'être of our Society and, to pursue the extraordinary ideas and enthusiasm of Fathers of Europe, we shall do our best to accomplish their dream of a Europe of Diversity!

See you soon in Budapest for a new SEFI life chapter!



Françoise Côme
Secretary General since 1993

"SEFI is committed to diversity, equality and inclusion within our engineering education community. SEFI will continually review its policies and practices to fulfil this commitment and to ensure that it influences SEFI's activities and liaisons. SEFI operates according to values adopted by its Board of Directors."

* all acronyms of the partners and projects are listed at the www.sefi.be

Message from SEFI President

Diversity as an optimising force



Welcome to the SEFI 2018-2019 Annual Report, and I invite you to read about the activities and accomplishments of our community dedicated to improving engineering education.

As I reflect on SEFI over the last twelve months, the key theme that comes to mind is diversity. Diversity is important in a number of important ways within engineering education. Firstly, there is not one type of engineering university or college but several varieties, usually oriented along theoretical or practical approaches to education. SEFI recognises the importance of this variety, as there are many different types of engineering student who will not all thrive in the same type of educational environment. With the different types of engineering education available across Europe, every aspiring engineer should be able to find a university and a programme that suits their approach to learning.

There is also much welcome diversity in the approach to learning offered by our universities. Active pedagogical approaches are beginning to become the norm as deans and programme leaders coax and convince our excellent academics on the literature about how students learn, and how best to engage students with their engineering programmes. The overwhelming majority of our engineering graduates will not work in engineers-only work environments, but will be on multi-disciplinary teams and working on multi-disciplinary problems. So, it should not be such a big step to say that our engineering students should learn in multi-disciplinary environments. In this regard, I would suggest that we generally still have work to do to increase the diversity of the academics involved in the education of our students.

In the quiet of the summer, it is relatively easy to get some perspective on the typical academic year, as one has completed, and the frenzy of the new academic year is not yet upon us. It is at these times that we can reflect on what we do in engineering education and how we do it, and see the important issues that each of us face. And yes, these issues will also be diverse and different for us depending on our roles and context within education. It is at this time of the year that we can reflect on whether our curriculum needs to be refreshed, or active pedagogies should be extended across an entire curriculum, or whether we have made the business case to the dean for a new lab or maker space.

There is never one issue, never just one approach, or just one solution. That is the real strength of engineering education – our inherent engineering skills gives us the ability to successfully improve what we do within engineering education. And for this, diversity enables innovation and creative approaches, and is not a limiting characteristic.

So, as I contemplate how I will approach the new academic year, I am looking forward to our SEFI 2019 Annual Conference in Budapest, with the conference theme of **Varietas delectat - Complexity is the new normality**, and a sub-theme of **Diversity in Engineering Education**. I look forward to meeting all the members of our SEFI community in Budapest.

Professor Mike Murphy, TU Dublin
29th President of SEFI 2017-2019

From SEFI Vice-Presidents

SEFI responds to changing reality of engineering education

The today's world is constantly changing, and so do the needs of society for engineers, their skills and competences they must master. It is SEFI's aim to support its members in their endeavor to reflect those changes in their curricula and to adapt their education to new settings such as Industry 4.0, Artificial Intelligence, or Entrepreneurial skills. SEFI has a special interest in Quality Assurance and Accreditation of the curricula and is a founding member of the European Network for Accreditation of Engineering Education (ENAAE). I am representing SEFI in the ENAAE Board and can insure the close ties between the two organisations.

The driving forces of SEFI's activities are the working groups. They are the think tanks and trendsetters of engineering education, which focus on one specific topic or function or activity of SEFI. To ensure that each working group has perfect conditions to thrive, SEFI has organised a Committee on Working Groups. As chair of this Committee together with its members and the HQ, we could rely heavily on the enthusiast collaboration of the chairs of each working group. They helped the Committee to analyse the needs of their working group and to translate these insights into specific SEFI actions, such as giving the groups more visibility at the conference.

A crucial function of SEFI is to provide a large forum for networking where members can learn from one another. In this context, SEFI continues to develop a large and varied membership. I was happy to chair the SEFI Committee on Membership. This Committee analysed the opportunities for membership growth and developed ways to contact new institutions and to bring them into the SEFI family.

SEFI is a constantly evolving organisation, which makes it an exciting place to meet other like-minded engineering education stakeholders. I look forward to another year of intensive cooperation, responding to the challenges of the ever-changing reality of engineering education.



Prof Yolande Berbers, KU Leuven
SEFI Vice-president

Chair of SEFI Committee on Membership
Chair of SEFI Working Groups Liaison Committee
SEFI Member of the ENAAE Board of Directors

SEFI as a key partner of international engineering education

Known for being the go-to platform where European individual engineering education stakeholders, institutions and companies cooperate, SEFI also exchanges and maintains strong contacts with other institutions and organisations worldwide. In the context of these SEFI external relations activities, I had the privilege to closely and intensively cooperate with a number of prestigious organisations, representing SEFI with keynote presentations or in meetings with official representatives of these organisations, such as AAEE, ASEE, CSEE, Tsinghua International CEE under the auspices of UNESCO, CAST, FEAIP, IFEEES* (where I have represented SEFI in its Executive Board for the past two years), and of course the student organisation BEST. Following these very interesting exchanges, joint projects have been elaborated (for instance, two joint papers with ASEE in the fields of Gender and Diversity, and of Credit transfer, are under preparation), and further to our existing memoranda of understanding with ASEE, IGIP, BEST, LAC-CEI, ASIBEI*, we signed a new one with CSEE in 2018.

Representatives from the above-mentioned organisations regularly attend our Annual Conferences and Deans Conventions and help to broaden our perspectives on the enhancement of engineering education. Furthermore, I was invited to deliver keynote presentations in Beijing and in

Hangzhou last October/November 2018, and to represent SEFI at the ASEE Annual Conference organised in Tampa in June. Occasionally, these relationships have led to new memberships at both individual and institutional levels. In reverse, several SEFI members have participated in the events of these partners which enabled those involved to have a unique chance to exchange ideas even further overseas which at the same time we helped the global visibility of SEFI. All these actions have contributed to SEFI's image of an appealing partner for quality, in-depth and diversified collaboration in engineering education.

SEFI maintains a strong position of the voice advocating for higher engineering education not only in Europe, but also in the world.



Prof Luis Manuel Sanchez Ruiz,
UP Valencia
SEFI Vice President

Co-Chair of European Engineering Deans Council
SEFI Member IFEEES Board of Directors

* all acronyms of the partners and projects are listed at the www.sefi.be

SEFI 2018 Annual Conference



17-21 September 2018 – Lyngby, Copenhagen DK

Engineering education experts from Europe and overseas met at the Technical University of Denmark in Copenhagen for one-week conference that covered the newest developments in engineering education relating to the topic of “Creativity, Innovation and Entrepreneurship for Engineering Education Excellence”. The organising team lead by Prof Martin Vigild, former SEFI president, prepared new formats of sessions and meetings and made the conference ever more varied and interactive.

Interactive Community Dialog

The author this year’s most discussed publication, Global state of the art in engineering education (a.k.a. MIT Report), **Ruth Graham**, consultant engineering education and entrepreneurship, brought together a panel of representatives of the emerging leaders in engineering education: Marcela **Angulo González**, Head of Technological Capabilities Division at the Chilean Economic Development and Innovation Agency, **Pey Kin-Leong**, Associate Provost Education at Singapore University of Technology and Design, **John Mitchell**, Associate Vice-Dean Education at UCL Engineering, **Eva Smeets**, master student at TU Delft, and from the host institution of DTU, **Anne Sofie Larsen**, also a master student. These representatives presented their engineering programmes from their specific point of view and then engaged in an interactive dialog with the public.

Keynote Presentations

Besides, we heard the stimulating keynote speeches: “Revolutionizing Engineering Diversity” by **Stephanie Farrell**, Professor and Founding Chair of Experiential Engineering Education at Rowan University (USA) and the 2018-19 President of the American Society for Engineering Educa-

tion; “How can we build the right competencies for the future when 65% of today’s students will have jobs that don’t even exist yet?” by **Charlotte Mark**, Managing Director at Microsoft Development Center Copenhagen and “How do we build successful companies and sustainable societies driven by the right talent?” by **André Rogaczewski**, CEO of Netcompany.

Best papers:

- Best concept paper: Marc Lapperouza, EPFL - Assessing transversal skills in the framework of an interdisciplinary programme
- Best research paper: Oskar H. Svensson and Tom Adawi, Chalmers University of Technology- Investigating the dynamics of authentic learning in a project-based engineering course
- Best student paper: Julie Direnga, TU Hamburg - Retention of conceptual understanding – The impact of time pedagogy and teaching activity

Awards

The annual conference is also the occasion to award a number of SEFI prizes and awards. Namely the SEFI Francesco Maffioli award for Excellence for Developing Teaching and Learning in Engineering Education, the SEFI Fellowships and the highest distinction, the Leonardo da Vinci medal. And this year SEFI also recognised the extraordinary contribution of Erik de Graaf, the former editor-in-chief of the European Journal of Engineering Education.

We would like to thank the local organising committee lead by Martin Vigild, Peter Munkebo Hussman, Linda Citterio and Trylle Arnfred, the DTU staff, all people from SEFI involved for their tireless efforts to make this conference a truly brilliant one!

SEFI Leonardo da Vinci Medal 2018

Since 1983, the Leonardo da Vinci Medal is the highest distinction SEFI can bestow. The Medal is awarded once a year to a living person who has made an outstanding contribution of international significance to engineering education. This year, SEFI awarded the medal to Professor of Product Development and Dean of Education, Johan Malmqvist, Chalmers University of Technology, Sweden.

His engineering research focuses on development methodologies and IT support for product development. The results include new design methods and IT tools, but also empirical studies of product development practices. The research is conducted in close collaboration with Swedish industry. Current projects investigate methods and tools for development of product-service systems and knowledge-based engineering tools. Malmqvist was one of the co-founders of



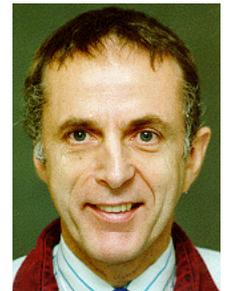
the Conceive-Design-Implement-Operate (CDIO) Initiative, an international effort that aims at developing a framework for improving engineering education.

SEFI Francesco Maffioli Award

The SEFI Francesco Maffioli Award of Excellence for Developing Teaching and Learning in Engineering Education is the European cup in Engineering Teaching. This very first edition of the Award went in memoriam to **Prof Ingvar Gustavsson** from Blekinge Institute of Technology.

Prof Ingvar Gustavsson won the award for his contribution in using remote experiments Virtual Instrument System In Reality (VISIR). He started developing the remote lab

in 1999, at the Blekinge Institute of Technology (BTH). His goal was to allow students to freely perform available experiments, while learning about electric and electronic circuits. Prof Gustavsson's vision enables students freely perform experiments, either locally or remotely.



New SEFI Fellows

Prof Ludo Froyen, KU Leuven

Ludo Froyen is now an Emeritus Professor. He has been 8 years Vice-Dean responsible for Education, and subsequently 8 years Dean of the Faculty of Engineering Sciences of the KU Leuven. In these roles he has actively promoted Engineering Education in General, and SEFI in particular, in the faculty of Engineering Science, and in the other faculties of the KU Leuven.



Ludo Froyen played an important role in SEFI, as an active member of the Board of Directors of SEFI for 6 years, he played an important role in the creation of the European Convention of Engineering Deans (ECED) and has been Chair of the Deans Council. He hosted the 2013 SEFI Conference in Leuven and played an important role in the organisation of the 40th anniversary of SEFI.

Prof Kamel Hawwash, University of Birmingham

It is customary for former SEFI presidents to receive this honour after their mandate has completed, and Kamel Hawwash was obviously no exception considering what he has achieved in engineering education leadership, and in SEFI leadership.



He brought the University of Birmingham in to SEFI as an institutional member. Because of his high profile within the United Kingdom, he was instrumental in helping other universities decide to join SEFI also. He played a leadership role in organising and hosting the European Convention of Engineering Deans (ECED) in Birmingham in 2013 and the year after a very successful SEFI Annual Conference on *Educating Engineers for Global Competitiveness*. He has taken leadership roles in key SEFI projects on Attractiveness and Engineering Graduate Skills.

New SEFI Fellows

Prof Eva Sorensen, UCL Engineering

Throughout her time at UCL, Prof Sorensen has made significant contributions to teaching & learning within the department, the Faculty and College in general, as well as beyond UCL, both nationally and internationally. Most notably, over the last five years, she has been a member of a small Faculty team who has restructured the entire Faculty undergraduate programme and introduced the new Integrated Engineering Programme (IEP) at UCL, now in its fourth year. The IEP is making extensive use of problem- and project-based learning through hands-on activities, which the students, around 800 across the Faculty, take part in throughout their first two years of study.



General Assembly 2018

18 September 2018, DTU Lyngby

At the general assembly elected the following new members of the Board of Directors for a three-year period:

Klara Kovesi, ENSTA Bretagne;
Gorkem Kulah, Middle East Technical University.

and elected for a second mandate:

Sirin Tekinay, Sabanci University;
John Mitchell, UCL London;
Zbynek Skvor, CTU in Prague;
Gerhard Mueller, TU Munich; and
Manfred Hampe, TU Darmstadt.

The members also elected **Luis Manuel Sanchez Ruiz**, Universidad Politecnica de Valencia, for a second term of vice-presidency for the period of 2018-2020.

Physics Teaching in Engineering Education Conference 2019

22 - 24 May 2019 - Delft, NL

PTEE 2019, 10th Physics Teaching in Engineering Education Conference gathered together 35 participants from 9 countries. Themes of the presentations were "Activating students", "Physics labs", "Physics knowledge and the skills of freshmen" and "Industrial demands and interface with industry". Participants enjoyed up to date presentations, lively discussions, local hospitality and a sunny weather. The next PTEE conference will be organised by Tampere University of Applied Sciences, Finland, in 2021.



European Convention for Engineering Deans 2019

26 - 28 May 2019 - Leuven, BE

The 2019 SEFI European Convention of Engineering Deans was organised by KU Leuven and brought together over 80 participants from 42 universities and 21 countries of Europe and overseas. The two-day programme focused on the topic Crossing the Borders between universities and industry and explored the matter from various angles in engaging presentations and group discussions.

In his opening speech titled Crossing Borders, Blurring Borders. The future of University-Industry collaboration, rector of KU Leuven **Prof Luc Sels** spoke about practical implications and examples KU Leuven engagement with industry. KU Leuven has been actively engaging with the industry for many years. The result of this collaboration is an entrepreneurial university. However, there are still challenges to be dealt with, specifically upscaling the student internships in



A panel discussion with faculty and industry leaders moderated by Prof. Tinne De Laet.

companies and resistance of the faculty to dual learning. **Prof Todd Davey**, director of the University Industry Inno-

vation Network and Institut Mines-Télécom, brought the attention to the European scale of University - Business Cooperation. He introduced results of a big comprehensive study that was made so see the state of the art of this cooperation in almost all the European Countries. The study revealed the key motivators or U-B cooperation of the 3 parties. For HEI Management, the motivator is increase funding, skilled graduates and getting research methods into society; for academics, the most important are research insight and again getting research more into the society. For the businesses it is mainly the new discoveries and innovation.

In the afternoon, each attendee could choose to attend two group discussions on two of 5 sub-themes of the convention:

1. Towards meaningful student experience Most students don't become academics and therefore could find contact with companies useful. As sometimes industry is more advanced. This could also help with retention of students. However, the companies should be carefully selected.

2. Outgoing Mobility of Faculty Staff It is hard to move from university to industry for multiple reasons and also for the lack of suitable contracts. What could industry do with mid-career academics?

3. Incoming Mobility of Business Professionals How to better integrate professionals from industry - facing the challenges of publication, salary gaps etc. To tackle this is challenging for the HR departments. People are in rotating jobs, however academics seem to have life-time attitude to their jobs. How to truly integrate both in long-term perspective?

4. The academic PhD: lost in limbo or the perfect start for an industry career? Most PhDs do not continue in an academic career, which means they end up in the industry. What is their role? Do they end up doing jobs for which they could do with just master degrees?

5. The engineering curriculum in co-creation Is it possible to create the curriculum together with the industry or answering to the market needs is not the role of the universities?

After the breakout sessions digital champion **Saskia Van Uffelen** shook the audience by her presentation Dare for tomorrow. Leading, working, learning and living in a digital world. European government chose her as a digital champion for Belgium and in her role she tries to project what world will look like in near future. The mindset of the society has already changed, production cannot be increased to infinity, therefore comes the digital disruption: manage business today and rethink the organisation tomorrow. Creativity and innovation are digital skills.

The dean of KU Leuven Dean of the Faculty of Engineering Science, **Prof Michiel Steylaert**, introduced the second day of the programme making a strong point for the importance of Research in Engineering Education.



Participants of the ECED 2019 in Leuven.

The president of ENSAM, **Prof Laurent Champany** continued with his presentation of ideas on how to bring industry to school. The perspective this time is the one of the most prestigious school of science and technology. His institution wants its students to get to know the products in all stages. Professor Champany introduced a multitude of programmes and schemes of how his school works with this industry. The school also tries to teach the human values for the industry of the future through extracurricular activities.

After a short break, all participants gathered to a panel discussion with **Prof Gerald Farrell**, TU Dublin, **Prof Dr Laurent Champany**, ENSAM Paristech, **Prof Dr Jo Van Caneghem**, KU Leuven and **Mr Ivo Christiaens**, Siemens, moderated by **Prof Tinne De Laet** from KU Leuven to re-visit the sub-themes of the convention one more time in this interactive format.

In his closing remarks, SEFI president **Prof Mike Murphy** mentioned that industry puts universities under pressure in order to get more well-rounded graduates while students too have requirements for relevant programmes and engaging learning process. Faculties wish for opening possibilities for different models of employment. Therefore, there should be a lot of flexibility in the cooperation between universities and the industry; We take into account that it becomes a norm for staff to be mobile between universities and industry, for this we need flexible HR practices. Furthermore we should provide new formats for individualisation of education and incorporate lifelong learning, starting with earlier engineering education (primary, secondary).

We are delighted to announce that the upcoming ECED 2020 will be organised at the University of Carlos III in Madrid on 2-4 April 2020.

European Journal of Engineering Education

Submissions

During the academic year 2018/19, the Journal had slightly fewer submissions than the past years, mainly because no calls for special issues were open during this time. There is also a small increase in regular submissions. See Table 1.

Academic year	15/16	16/17	17/18	18/19
Submitted manuscripts - regular	197	218	212	228
Submitted manuscripts - to special issues	65	74	56	2
Total submitted manuscripts	262	292	268	230

Table 1. Submissions to the European Journal of Engineering Education (excluding submissions of revised manuscripts).

New aims and scope

The current acceptance rate is just below 20%. It was lowered to this level in January 2018 (as the new editorial team took office), as a necessary adjustment to avoid exceeding the available space in the journal. But raising the threshold is also a matter of editorial policy. Editors must decide, supported by reviewers' recommendations, which papers best earn a place and should be prioritised over other good papers. To reflect the current state of the journal and describe the new threshold in qualitative terms, a new Aims & Scope* was formulated. The two fundamental quality criteria are usefulness and scholarliness:

- Usefulness does not simply mean that the work reported was beneficial in the context where it was made, but that the paper can be useful to readers, be they educators or scholars in the field of engineering education.
- Scholarliness implies that a paper should be well-crafted and coherent, with a sound approach including awareness of existing literature.

These criteria apply simultaneously to all papers, though they can be fulfilled in diverse ways. As always, it is decided on a case-by-case basis which papers pass the threshold. We are truly grateful to the reviewers for applying their judgement to enact these criteria.

*) www.tandfonline.com/action/journalInformation?show=aimsScope&journalCode=ceee20 or see the back cover of a print issue

Special issues - new policy and call for papers

The new editorial team has formulated a new policy for special issues. The aim is to have one or two special issues per year, which should be state-of-the-art achievements of the field. A first call for papers was published in April 2019. The theme is "Early Career Engineers and the Development of Engineering Expertise". Guest editors are Jeff Buckley, Athlone Institute of Technology, Ireland, James Trevelyan, The University of Western Australia, Australia and Christine Winberg, Cape Peninsula University of Technology, South Africa.

Format-free submission

The journal now uses format-free submission, which means that authors can use any scholarly style. Once a manuscript is accepted for publication, the publisher will format it to the journal style. See <http://authorservices.taylorandfrancis.com/format-free-submission>

Workshop for reviewers

At the SEFI2018 conference, we led the workshop "Reviewers, reviewers, reviewers!" together with editors of Journal of Engineering Education, IEEE Transactions on Education, and Nordic Journal of STEM Education. The workshop received enthusiastic feedback and helped us recruit several excellent reviewers. Following this success, workshops for reviewers and for prospective authors will be held at future SEFI conferences, and for instance at REES (Research in Engineering Education Symposium).

News in the editorial team

New Associate Editor

We welcome **Jenni Case** as new Associate Editor since January 2019. We invited her because of her sharp mind and outstanding scholarship, as well as her international experience, outlook and reach.



Since 2017 Jenni Case is Head and Professor in the Department of Engineering Education at Virginia Tech, USA. She was previously in the Department of Chemical Engineering at the University of Cape Town, South Africa, where she attained full professor status in 2012 and remains an honorary professor. In 2011, she was a Mandela Mellon fellow at

Harvard University. She was the founding president (2010-2013) of the South African Society for Engineering Education (SASEE). Her work focuses on the student experience of learning in science and engineering education.

Editorial board turnover

The journal wishes to extend heartfelt thanks to the following former board members for their support and efforts in the past:

A. Akay, G. Augusti, A. Beraud †, H. L. Hartnagel, B. Macukow, H. Mann, F. Michau, L. Mustoe †, P. E. Nüesch, G. Patko, M. F. Ramalhoto, H. Shihaby, A. Squarzoni, A. Stojcevski, and A. F. Zobaa.

New members in the Editorial Board:

Shannon Chance, TU Dublin, Ireland
Tinne De Laet, KU Leuven, Belgium
Anne Gardner, University of Technology Sydney, Australia
Ruth Graham, R.H. Graham Consulting Inc., UK
Rui Lima, University of Minho, Portugal
John Mitchell, UCL, UK
Roland Tormey, EPFL, Switzerland
Jan van der Veen, Twente University, Netherlands
Patric Wallin, NTNU, Norway

Acknowledgements

On behalf of the journal, we wish to thank first of all the reviewers, who so generously contribute to the selection and improvement of every manuscript. We thank the authors whose high calibre work is what makes the journal. Finally, we gratefully acknowledge invaluable support from the teams of SEFI and Taylor & Francis.

Editor-in-chief

Kristina Edström, KTH Royal Institute of Technology, SE

Deputy Editors

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Maartje van den Bogaard, TU Delft, NL

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Jenni Case, Virginia Tech, USA
Anette Kolmos, Aalborg University, DK
Bill Williams, TU Dublin, IE



Kristina Edström

Contact: ejee.editor@gmail.com

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SEFI EU PROJECTS

Attractiveness

The Erasmus+ project A-STEP 2030 (Attracting diverse Talent to the Engineering Profession 2030) has started in September 2018 with the participation of ENSTA Bretagne (project coordinator), TU Dublin, Aalborg University, Metroplia University of Applied Sciences, BEST, Universum Global, SEFI and nine associated partners. This strategic partnership project was initiated in the framework of the SEFI WG on Attractiveness and the consortium essentially consists of working group members.

For the project development, a first face-to-face meeting was organised on 29-30 January 2019 at the SEFI in Brussels with the financial support of the Brittany Region in France. The main objective of the project is developing a new and innovative curriculum to teach appropriate skills and competencies for a sustainable future and to encourage young people to be enthused about an engineering career.

In the first semester of the project a first report was provided on the future roles of engineering in the society and the skills and competences required for engineers for a sus-



Co-funded by the
Erasmus+ Programme
of the European Union



Participants of transnational meeting at TU Dublin

tainable future based on a literature review and the results of the PERFECT project. At the end of the year, qualitative and quantitative surveys were prepared for the first semester of 2019. The results of these surveys will be disseminated in the European Journal of Engineering Education and the SEFI annual conference in Budapest.

www.astep2030.eu

Employability

The PREFER project (Professional Roles and Employability of Future EngineerS), an ERASMUS Knowledge Alliance project between KU Leuven, TU Delft and TU Dublin, and from which SEFI is an associated partner, is getting up to speed. The developed Professional Roles Model consists of three positions that reflect possible career paths for new graduated engineers: Operational Excellence (focus on process/product optimization), Product Leadership (focus on radical innovation), and Customer Intimacy (focus on tailored client solutions).

After a thorough validation of the model with various stakeholders, a test tool has been developed in the academic year 2018-2019 together with researchers of KU Leuven, TU Dublin and professionals of BDO. This test tool will enable engineering students to explore their preferences, strengths and weaknesses with respect to a number of professional skills. The main part of the PREFER tool consists of 23 Situational Judgements Tests wherein students need to evaluate the appropriateness of 4 different responses given a particular professional situation. After a series of expert reviews by engineers of Siemens, Bosch, Arup, Engie and ESB, the test tool has been piloted with 340 master students of KU Leuven and TU Dublin. The development team is now entering the implementation stage.

The development of new, innovative curriculum elements to prepare engineering students on their future roles is well



The PREFER Project team at KU Leuven

on its way. The first elements – a communication exercise - were trialled in an MSc course at TU Delft last academic year and replicated at KU Leuven and TU Dublin. A second, bootcamp-style curriculum element aimed at students experiencing all three roles in one week was piloted in Delft in the academic year 2018-2019. Additionally, a pitching workshop has been designed by the research team in Delft.

For more details on the deliverables of the project, we kindly invite all SEFI members to attend the PREFER paper session or participate in the workshop at the SEFI 2019 Conference.

www.preferproject.eu

Creative Engineering Education

As a part of Education, Business and Community Cooperation Model for a Creative European Engineering Education project, we have specified and analyzed the relevance of the skills for engineering education that are based on the convergence of project/problem-based learning, engineering and product design using rapid prototyping and computer-aided design methods. The conducted study assessed the overall perception on the acquired level of 14 skills. More than 1000 respondents participated in the survey, including the industry representatives, academic staff, students and members of local authorities. The results of this survey indicate the crucial role of methodological and technical skills. More than two thirds of respondents believe that technical problem analysis skills should be acquired at the proficiency or advanced level.

The project team produced guidelines for integration of the skills relevant to engineering design and development of innovative products. They shared knowledge and best practices for the improvement of curricula and syllabi integrating the essential set of skills for engineers. The guidelines explain how to implement the selected skills in the curriculum, redefine problems and outside boundaries of a study course and includes: a study case and/or an innova-



Participants of transnational meeting at SEFI HQ in Brussels

tive project idea creation model; student team building recommendations; guidelines for integration of the selected skills into curricula and syllabi; updated model of facilitator roles and skills, based on the work done in the previous EPICES project.

The project results are presented and discussed in the national workshops and in workshops organised at the SEFI Annual Conference.

www.sefi.be/activities/eu-projects/ebcc/

Calendar of Events

SEFI organised or has participated in the following events in Europe and worldwide, as well as organised multiple bilateral meetings and visits of partner organisations.

September 2018

- **Engineers Europe Advisory Group launch** - Brussels, BE
- **SEFI Annual Conference** - Copenhagen, DK
- **General Assembly of SEFI** - Copenhagen, DK

October 2018

- **7th Intl. Symposium on PBL** - Tsinghua, CN
- **International conference and round table on the Future of Engineering Education** - Brussels, BE
- **SEFI Steering Committee** - Castellanza, IT
- **International Conference on Transdisciplinary Multispectral Modelling and cooperation for the preservation of Cultural Heritage** - Athens, GR
- **A-STEP Transnational Meeting** - Paris, FR

November 2018

- **EBCC Model Transnational Meeting** - Thessaloniki, GR
- **International Conference on Science, Technology and Education Policy** - Huangzhou, CN
- **BEST Career Day** - Grenoble, FR
- **WEEF-GEDC 2018** - Albuquerque, US
- **ENAAE Administrative Council and GA** - Lisbon, PT
- **International Forum on Engineering Capacity** - Beijing, CN
- **European Innovation Summit Week** - EP Brussels, BE
- **SEFI BoD Meeting** - Brussels, BE

March 2019

- **French National Engineering Days** - FR
- **Regional GEDC Industry Forum** - Bucharest, RO
- **Transnational meeting EBCC model project** - Brussels, BE
- **Steering Committee Meeting** - Enschede, NL

April 2019

- **Transnational Meeting A-STEP Project** - Dublin, IE
- **A-STEP Project – Transnational meeting** - TU Dublin, IE
- **EDUCON2019 – IEEE Global Engineering Education Conference** - Dubai, UAE
- **International Materials Education Symposium** - Cambridge, UK
- **30th anniversary BEST General Assembly** - Krakow, PL

May 2019

- **Forum for the Development of Engineering Education** - Coimbra, PT
- **Engineering Professors' Council (EPC)** - London, UK
- **MIPRO 2019: Engineering Education** - Opatia, HR
- **SEFI Physics Teaching in Engineering Education** - Delft, NL
- **Regional Engineering Pedagogical Conference** - Bremen, GE
- **SEFI 11th European Engineering Deans Convention** - Leuven, BE

June 2019

- **Webinar with JMP and KU Leuven**
- **EEAG/E4E meeting** - Brussels, BE
- **Consortium of 15 organisations for better Horizon Europe**, Brussels BE
- **SEFI Board of Directors meeting** - Leuven, BE
- **Integration of refugees into EU academia** - Brussels
- **ASEE Annual Conference** - Tampa, FL, US
- **International Women in Engineering Day (WES)**
- **FEAIP Convention** - Xi'a, CN

July 2019

- **Global GEDC Industry Forum** - Fontainebleau, FR
- **Consortium of 15 organisations for better Horizon Europe**, Brussels BE
- **BEST Symposium on Education** - Brno, CZ
- **Research in Engineering Education Symposium 2019** - Cape Town, ZA
- **IIDEA Workshop**, Tsinghua, CN
- **BEST Symposium on Education** - Athens, GR
- **BEST Symposium on Education** - Skopje, MK
- **LACCEI International Conference for Engineering, Education, and Technology** - Jamaica, NY, US

August 2019

- **BEST Symposium on Education** - Aveiro, PT
- **SEFI BoD online meeting**
- **Consortium for better Horizon Europe** - Brussels BE

Coming up in autumn 2019

- **ACOFI International Conference** - Cartagena, CO
- **IGIP Annual Conference** - Bangkok, TH
- **47th SEFI Annual Conference** - Budapest, HU
- **Global Engineering Deans Council** - Santiago, CL
- **World Engineering Education Forum** - Chennai, IN
- **Governing Board of CEE Univ. Tsinghua** - Beijing, CN

SEFI Working Groups

Engineering Education Research

The aim of the Working Group is to serve this community, which contributes to future enhancement of the education of engineers through research that combines scholarliness and usefulness.

In the last year, the SEFI's working group on Engineering Education Research (EER) focused on the further development of the engineering education research field, and hereby engineering education as a whole, in Europe.

The most visible activities of the working group last year took place at the Annual SEFI conference in the Copenhagen, Denmark. We organised a well-attended pre-conference *doctoral symposium*, bringing together PhD students in engineering education with experienced researchers. At the upcoming SEFI conference in Budapest our working group will organise the second edition of the symposium. At the last conference we shaped our *"open meeting"* with short pitches where all board members introduced themselves and their research followed by

*"Need for key reference
in Engineering Education
Research"*

small group discussions. We are going to repeat this format this year, but now focusing on the exploration of topics for joint collaboration. Our working group's workshop on *Key References in Engineering Education Research* was a tremendous success where participants actively explored the key references in small teams. We hope to continue this success in Budapest with our workshop *Recent References in Engineering Education*. Our annual activities at the SEFI conferences aim to provide a strong support for the future of engineering education research.

Prof. Dr. ir. Tinne De Laet, KU Leuven
Chair WG EER

Mathematics in Engineering Education

SEFI Mathematics Working Group aims to contribute to the development and improvements of engineering education in Europe is primarily focused on finding answers to many questions arising in connection to the challenges of teaching effective courses in mathematics for all engineering students developing their mathematical competencies and skills.

Activities of working group are coordinated by the steering committee consisting of enthusiastic volunteers. Work of the group is coordinated by the chair, Daniela Velichová, Slovak University of Technology in Bratislava. The steering committee members meet regularly in annual working meetings organised at the end of the year at the STU in Bratislava to summarize all the group work, analyse feedback from organised events, evaluate impact and plan the future activities.

The main activity of the Working group is organisation of regular bi-annual SEFI-MWG European Seminars on Mathematics in Engineering Education. The current issue on the table is how to develop and assess mathematical competencies in engineering mathematics courses. Questions about the best strategies in teaching mathematical subjects at technical universities and

*"Finding answers
to new challenges"*

possible ways how to adopt them into the educational practice are regularly discussed by participants of the SEFI annual conferences. The group explores the possible cooperation with the SEFI WG on Physics.

During the year 2019 we have started to prepare our next professional seminar, which is going to be held as The 20th SEFI-MWG European Seminar on Mathematics in Engineering Education, June 15-17, 2020 in Kristiansand, Norway, jointly organised by the University of Agder and the MaTRIC centre of excellence

The group intends to foster discussion and provide orientation and supportive material for the steady and balanced mathematical education of engineers in Europe. You are invited to join these discussions at the SEFI Conference.

Daniela Velichová, Slovak University of Technology
Chair MWG

Physics in Engineering Education

The SEFI Working Group on Physics and Engineering Education assembles physicists who teach physics to engineering students, who often are at the beginning of their engineering studies. Physics teachers encounter similar problems irrespective of the country and the weight, the generality and the applicability of the courses they are responsible for.

The main action of the PWG is to organise a conference "Physics Teaching in Engineering Education (PTEE)" for every two or three years. The latest event was in Delft, in

the Netherlands, on 23-24 May 2019, hosted by the Hague University of Applied Sciences. The next event will be in Tampere, Finland on May 2021. More info will be at www.sefiphysics.be

Juho Tiili, Tampere University of Applied Sciences
Chairman of PWG

*"The importance
of fundamentals"*

Open and Online Education

SEFI working group on Open and Online Education is interested in new technologies that remove barriers and provide more students with access to engineering education. We are also interested in new possible educational formats and in helping to advance the development of more personalised education by introducing evidence-based, data-driven educational practices.

In the past year, we have retreated to come up with new strategies on how to connect the engineering education professionals that identify with the group's mission. During the quarterly meetings between Calvin Rans and Pieter de Vries (WG Co-Chair), a new communication platform to use as an active engagement tool for the working group in the future has been identified and it will be officially launched at the SEFI 2019 Annual Conference in Budapest.

The working group has also prepared an interactive

workshop for the SEFI conference. The idea is to engage the SEFI community in defining Online Education, what it means to them and their institution, their personal feelings about Online Education, etc. Participants will be asked to answer a list of questions prepared by the group and the results will be compiled into video(s) that will be posted on the community website and will be used spark discussions on Online Education.

Our working group is open to new members interested and/or experienced in the fascinating field of Open and Online Education.

Calvin Rans, TU Delft
Interim co-chair WG OOE

"Creative online education"

Gender and Diversity

The working group on Gender and Diversity is to develop engineering education and engineering professions in a gender inclusive way, reflected by participation rates of women, retention rates of women, gender awareness among academic staff and satisfaction of women engineers in the workplace. Our vision is to create and foster environments where every individual is respected and no one feels marginalised.

In the past two months, SEFI working group on Gender and Diversity has been working with ASEE colleagues on a Joint Statement on Diversity.

SEFI team is composed by **Inês Direito** (co-chair), University College London; **Anne-Marie Jolly**, Université d'Orléans; **Yvonne Galligan**, Technological University Dublin, and **Sara Clavero**, Queen's University Belfast (recently joined TU Dublin). ASEE team is composed by Susan Walden (co-chair), University of Oklahoma; **Lesley Berhan**, University of Toledo; **Linda Vanasupa**, Olin College; and **Eric Specking**, University of Arkansas.

The teams have been meeting online and working collaboratively. Inês Direito and Susan Walden met at ASEE 2019 Annual Conference, in Tampa, Florida on 16-19 June 2019. A final draft of the paper is expected to be ready by the end of the year.

We also would like to thank here our immediate past Chair, in the person of Dr Kacey Bedoes, who has taken care of the WG's activities over the last year in cooperation with our late colleague Dr Susanne Ihlen.

Inês Direito, University College London
Acting chair of WG G&D

*"Transatlantic cooperation
about Gender & Diversity"*

Quality Assurance and Accreditation

Our working group activities are linked to new trends in accreditation. This year, we have worked on a new position paper that will soon be published. The WG chair Prof. Jolly was invited by the UK's Engineering Professors Council for a debate on accreditation versus innovation, which took place at UCL on 14 May 2019.

The most current topic in the field of accreditation are the engineering systems in particular countries; through the discussions in the group and cross-border cooperation in accreditation, we expect to stimulate pedagogical innovation of our education systems. This also brings us back to the idea of transnational accreditation, which some of the national accreditation bodies still do not consider.

The group chair also participates in the Label Committee of ENAEE, where they are currently developing new skills

Attractiveness of Engineering Education

The Working Group on Attractiveness contributes to enhancing the attractiveness of engineering education to potential students - academics, industrialists and those involved in initiatives to enhance the attractiveness of engineering education.

In the past year, our working group has been actively preparing the ERASMUS+ project A-STEP 2030, gathering together information about the factors attracting students to engineering studies. In this work all the members of SEFI community have been able to give their contribution during a workshop, held as part of the 2018 annual conference in Copenhagen. This workshop was attended by more than 60 active participants, who gave their appreciated contribution by adding value to the work of defining the future needs of the competences created by the 4th industrial revolution and UN SDGs. In addition, the values and expectations held

Continuing Engineering Education and Lifelong Learning

At the SEFI Conference 2018 at DTU, Denmark the working group co-organised two workshops: *Skills and competencies for the Engineer of 2030 to meet sustainability challenges* and *Dare to be Agile – New Forms of Workplace Integrated Learning*. The workshops were very well attended and the outcome was fruitful for the projects supporting the workshops.

Discussion focussed on the working group projects (A-STEP 2030 and ALTEF) and the following areas: Disruption (65% of jobs not created yet); Classical teaching methods -> greater need for soft skills?; Ruth Graham – frontrunners, WBL (work based learning)?; Focus on communication, teamwork, innovation, entrepreneurial, lifelong learning; What we see as transition process for universities worldwide.

"New skills evaluation"

evaluation guidelines, the relevance of EAFGS (EUR-ACE Frameworks and Guidelines) to the development of engineering programmes.

The debate on QAA concerns the fact that accreditation and particularly EAFGS launched by EUR-Ace is or is not convenient for engineering programme development. Other frameworks, such as the one of CDIO, consider only general aspects of engineering programmes and not very specific details of curricula. A flexible accreditation framework created by the agencies should allow space for continuous improvement.

Anne-Marie Jolly, Polytech Orléans
Chair WG QAA

"Attracting diverse talent in Engineering Education"

by the young generation engineers of their future work has been studied.

The WG has also been maintaining continuous cooperation with the WG CEE and the International Association of Continuing Engineering Education IACEE (www.iacee.org), as the attractiveness of engineering education is very much dependent on the attractiveness and continuous enhancement of the engineering profession.

Katriina Schrey-Niemenmaa, Finland
Chair WG on Attractiveness

"Fascinating learning"

The WG's collaboration with the SEFI WG for Attractiveness has resulted in a joint project application for a Strategic Partnership Erasmus+. The project was granted in September 2018 and its ultimate aim is to create an attractive and fascinating learning environment to encourage young people and adult learners to engage in engineering studies and the profession as a whole.

Bente Norgaard, Aalborg University
Chair of WG CEE&LLL

Curriculum Development

In the past year, the working group on Curriculum Development has presented research projects to the EU. Their objective was to seek to collaborate with entities outside Europe to enrich the curricular development of engineering education around the world.

Furthermore, we cooperated with the HORIZON2020 STIMEY project. This project, proposes an educational platform with multi-level components, designed and developed based on a well-researched pedagogical framework, which aims to make STEM education more attractive to young people between 10 and 18 years old. The socially motivational platform for emotional and educational engagement, herein referred to as the STIMEY (Science, Technology, Innovation, Mathematics, Education for the Young) platform, will combine: social media components and entrepreneurial tools (present);

“Tools for emotional and educational engagement”

robotic artefacts (the future); radio (the past). Some of the experts from our working group advise the international partnership of this project.

For next year the CDWG wants to develop an automatic platform for comparison and integration of engineering content, not only for university students, but also for younger students who can discover the interesting and useful aspects of our subjects.

Carlos Rioja del Rio, University of Cadiz
Chair WG CD



Outcome of a multidisciplinary project-based learning methodology

Brian Hayt, Solutions Marketing Manager, National Instruments

Today, we are living in an era of great technological acceleration. Much of the technology we experience daily was invented in just the past 50 years, and this century will see the same number of innovations as created over the past 20,000 years. The students in the classroom have experienced and embraced new technology at a pace never seen; accessing data, solving complex math, and communicating with people across the world all happen in a blink of an eye. These students' expectations of their engineering degrees, careers, and lab experiments are higher than ever, requiring continuous change and adaptation in teaching and laboratory methodologies.

Today, industry have three main expectations from academia: Integration of teamwork and multidisciplinary problems into the curriculum; Designing projects and problems around real grand challenges and Educating students using modern, industry-relevant tools.

Project-based learning and active learning have fulfilled many of these requests; however, we need to continue to look ahead. What are the next steps in the great acceleration of technology?

Multidisciplinary education enables us to tackle the major engineering challenges that students are excited to address. It prepares students to work on complex engineering problems such as building and designing an autonomous vehicle, enabling renewable energies or simply automating a cup of coffee in the morning. It takes engineers of every discipline coming together to understand both the big picture and how they can contribute. Integrating similar course topics and placing students in a real environment of cross-functional collaboration can go a long way to reduce the space problem and encourage students to enroll. NI has directly partnered with companies and schools to create a solution for multidisciplinary, project-based education: NI ELVIS III. The first of its kind, this IoT-ready solution combines instrumentation, embedded programming, multimedia and interactive teaching resources, and experiments all in one solution.



Forward-thinking engineering programmes that invest in a multi-disciplinary design approach are developing modern engineers who are able to make an impact, even before graduating. Examples of undergraduate innovators can be found in places such as the University of Southampton in the United Kingdom and Aarhus University in Denmark. The students from Southampton applied their Mechanical Engineering degrees toward designing a unique power-assisted handcycle to help Alex Lewis, a quadriplegic from the United Kingdom, and Emebet Dires, a double amputee from Ethiopia, climb the highest mountain in Ethiopia. The Aarhus University Mechatronics Engineering students designed an autonomous aquatic drone that expands our climate research data by collecting samples in regions previously unreachable by traditional boats. The ability to translate theory into the types of systems that are raising charitable funds in Ethiopia and aiding climate researchers in Denmark today are showing the possibilities of a future driven by engineers dedicated to improving our everyday lives, and National Instruments was excited to recognize them at NIWeek 2019 as finalists in the global National Instruments Student Design Competition.



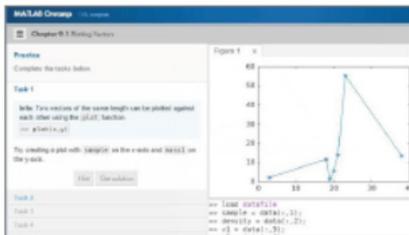
Resources and Tools for Educators and Students

Explore these online resources to learn more about integrating MATLAB and Simulink into your teaching, research, and studies

Get Started for Free with MATLAB Onramp and Deep Learning Onramp

matlabacademy.com

In just two hours, you can master the basics of MATLAB and start using MATLAB for deep learning through these online courses. With Deep Learning Onramp, try hands-on exercises that guide you through the deep learning workflow, which includes reading image data, classifying images, and evaluating performance.



Online Learning Anytime, Anywhere – MATLAB Online and MATLAB Drive

mathworks.com/products/matlab-online

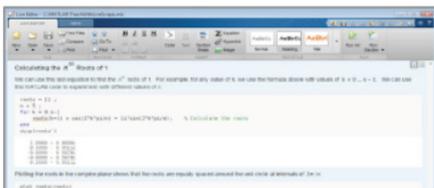
By running MATLAB Online directly from your web browser, you eliminate the need to download or install software. Plus, you're always using the latest version of MATLAB.



Interactive Notebooks – Live Editor

mathworks.com/products/matlab/live-editor

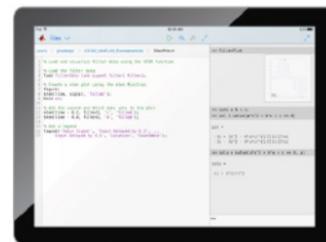
Live Editor allows you to accelerate exploratory programming, create an interactive narrative, and teach with live scripts.



Use MATLAB Anytime, Anywhere with MATLAB Mobile

mathworks.com/products/matlab-mobile

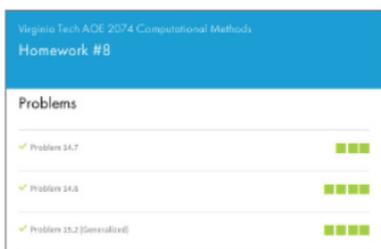
Your figures and workspace persist across sessions, so you can resume work when you next log in.



Online Autograding – Cody Coursework

mathworks.com/academia/cody-coursework.html

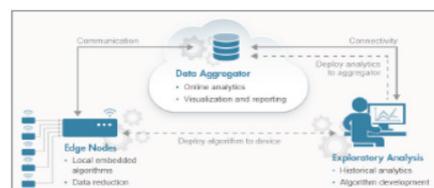
Cody Coursework is a visual, web-based environment that lets you create MATLAB programming assignments for students and it provides students with immediate feedback when they solve problems



Internet of Things Analysis – ThingSpeak

thingspeak.com

ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize, and analyze live data streams in the cloud. It enables engineers and scientists to prototype and build IoT systems without setting up servers or developing web software.





Continuing the Journey of Materials Education...

Granta Design is now ANSYS Granta

In February, Granta Design was acquired by ANSYS Inc., the global leader and innovator of engineering simulation software. The Granta Education Team is very pleased to continue our work with the materials and engineering education community, but now as part of a larger organisation with much stronger links to simulation.

What's new in CES EduPack 2019?

CES 2019 EDUPACK

- + **Material Science and Engineering Edition**
- + Supporting Teaching around the **UN Sustainability Goals**
- + **New UI Languages:** Spanish and German
- + Improved **Data on Fibres**
- + Updated **FEA Exporters**

Supported Software Tools:

- Abaqus
- ANSYS Mechanical APDL (ANSYS Classic)
- ANSYS Workbench
- Mat/IL
- Nastran
- Creo Parametric (Pro/ENGINEER Wildfire)
- solidThinking Inspire
- SolidWorks

New Faces in the Education Team

The past year has seen an exciting period of team growth. Dr. Mauricio Dwek and Dr. David Mercier joined our new Lyon office in France, while Dr. Susannah Cooke and Dr. Wen Zhao joined our University Relations Team in Cambridge, UK. Also, Dr. Kaitlin Tyler became our first Granta Education Fellow, based in the USA. In April, Dr. Soma Chakrabarti, the current President of International Association for Continuing Engineering Education, joined as our Teaching Resources Team Leader. More details of our team members can be found on our website:

grantadesign.com/education/community

Material Education Symposia

In April we helped coordinate the largest ever International Materials Education Symposium (IMES 2019) at the University of Cambridge. Rich in presentations about new engineering education methods and materials education innovation, the symposium drew in 160 participants from 36 countries. The purpose of the symposium is to:

1. Share ideas, innovations, experiences, successes and failures
2. Provoke productive discussion around these issues
3. Expand the links form a key feature of the Materials Community

We would like to thank the participants for making it an outstanding success and take this opportunity to express our appreciation for the continued advice and support of colleagues at ASM International, the European Society for Engineering Education (SEFI), the Federation of European Materials Societies (FEMS), the International Federation of Engineering Education Societies (IFEES), The Minerals, Metals & Materials Society (TMS), and the Departments of Materials Science and Metallurgy and Engineering of the University of Cambridge.



materials-education.com



The accelerated emergence of Learning Centers

Xavier FOUGER – Senior Director Learning Centers and Programs

An acceleration of the emergence of learning centers can be observed in various countries. Always inspired, often funded and sometimes operated by industry, such centers provide new learning opportunities in various fields, most frequently in domains that relate to the transformations of manufacturing industries also designated as “fourth industrial revolution”.

The economic case is compelling. Center's mission is to accelerate the adoption of new methods in industry through the creation and dissemination of knowledge and knowhow that aim at:

- Enhancing rapid **requalification** of employed professionals through continuing education,
- Solving existing or anticipated **capacity** shortages, especially in the middle-skill workforce, by increasing existing flows of employable young professionals,
- Preparing next generations of managers, engineers, technicians and operators to **new professional practices**, by means of initial education or specialization programs,
- **Attracting** younger generations to technical professions by showcasing contemporary ways of producing goods and services,
- Providing responses to **early needs for knowledge**, experienced by companies in the exploration or validation of new production methods in their specific context, particularly in small and medium businesses.

Investment and expertise are challenges. The cost of equipment of such centers is a potential obstacle for traditional institutions who consider providing students with a model factory or at least a hands-on lab enabling project experiences with new generations of industry grade equipment. For instance, an investment of 50,000 € for a modern entry-level robot, a 500,000 € investment for a small digitally controlled production cell or a 1,000,000 € budget for a metal 3D printer are common orders of magnitude. Operating such equipment and its digital operating environments requires sourcing of specific knowledge and generates further needs to invest in educators' training. These considerations have caused a limited or slow dissemination in academia of such learning facilities.

Beyond investment, the expertise ramp-up in academic staff is an inhibiting factor per se, as common practices of continuing educator's education are hardly compatible with the fast pace of innovation in manufacturing practices that happens in industry.

Yet, the urgency for large employers to upskill their workforce or recruit new talent remains critical to their short-term competitiveness. This context has led several companies to inspire or invest in learning centers.

Digital competences are pivotal. The foundation of the fourth industrial revolution is the broad set of new methods enabled by the digitalization of engineering and manufacturing processes. Digital models of products are required as direct input to production machines (3D printers, robots, automated production lines, logistic operations, etc.). This alone has profound impact on product design itself but major changes in work practices as well as a major impact in overall efficiency lie in the fact that collaborative platforms replace collections of applications. This “digital thread” produces new levels of instant connectivity with and across machines (the “industrial internet of things”, “virtual twins”, “digital continuity”,...). Above all, it drives considerable efficiency and versatility improvements through social collaboration among diverse stakeholders involved throughout entire value chains, across organizations, sites and countries. Operating within such a social network requires new skills that learning centers want to develop through new learning experiences.

By providing its process expertise alongside its 3DEXPERIENCE social Industry Platform to dozens of learning centers, Dassault Systèmes is actively involved in this global Industry Renaissance movement.

At Wichita State University, the “Innovation Campus”, also supported by Airbus, provides one of the world's strongest aerospace ecosystems with all services of a learning center. The 3DEXPERIENCE is used as backbone for Additive Manufacturing, Reverse Engineering and Inspection, Virtual Reality & Immersive Technologies and Multi-Robotics Advanced Manufacturing. Students benefit here from a new paradigm in applied learning guiding them through fast track, end-to-end projects.



“Campus Fab”, a center opening near Paris in September 2019, will provide a “factory of the future” to learners in vocational, technical and engineering studies. Initiated by Safran, it will also serve as an advanced learning resource for continuing education. Built around a central digital room operating the 3DEXPERIENCE platform, the facility offers hubs for additive fabrication, assembly, process maintenance and an industry-grade machining line producing “aeronautic quality/automotive capability” parts.

Centers truly redefine the way educational institutions and businesses collaborate. Dassault Systèmes is committed to make them succeed and welcomes any SEFI conversation about this promising subject.

Membership

New members

INSTITUTIONAL: Athlone Institute of Technology • Sligo Institute of Technology • Saxion University of Applied Sciences • Wageningen University and Research • TU Dublin • University Politehnica Bucharest

ASSOCIATE: ICE Publishing

INDIVIDUAL: Tom Goldfinch, AAEE • Martin Vigild, Denmark • Gillian Saunders, TU Delft • Ariadna Llorens – UP Catalunya • Ken Brown, Letterkenny Institute of Technology • Matteo Di Benedetti, University of Sheffield • Deolinda Dias Rasteiro, ISEC Coimbra • Pedro Cruz, University of Aveiro • Lucinda Berthoud, University of Bristol • Elmar Junker, Technische Hochschule Rosenheim • Rick Evans – Cornell University • Sheryl Sorby, University of Cincinnati • Daniel Sanchez Ruiz – ICACIT (Peru)

CORPORATE: JMP

Institutional members

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Seize our Common Future: Joint Call for an Ambitious Horizon Europe Budget

Europe is confronted with environmental, social, and economic challenges such as tackling climate change, ensuring citizens' health, wellbeing and security, boosting economic competitiveness and creating jobs. The undersigning organisations are fully convinced of the vital role of Research and Innovation (R&I) to cope with these challenges and the opportunities of the 21st century.

The joint effort at European level must be reinforced to achieve the transformation that Europe needs, in order to build a prosperous, safe, inclusive and sustainable future for the next generations. The EU Leaders have recognised this necessity during the Sibiu Summit, committing to stay united and build a Union fit for the future with the means to match these ambitions.

Investing in excellent cross-border collaborative R&I that has societal relevance is essential to achieve the Sustainable Development Goals and to build a prosperous future for European society. EU R&I plays a key role in:

- Benefiting millions of citizens in Europe by supporting and enabling researchers, innovators, businesses and civil society to use the knowledge and solutions they generate to improve the quality of life.
- Developing the skilled and talented people that Europe needs, investing in our human resources to strengthen its educational, knowledge and technology base for a more environmentally friendly and prosperous society.
- Fostering European scientific, technological and social leadership by supporting committed researchers that dedicate their excellence for the greater good of humanity.
- Boosting Europe's growth, employment and economic competitiveness by ensuring favourable conditions and policies to translate research results into innovative products, businesses and services.
- Strengthening Europe's innovation capacity, and preserving its place as a true leader on knowledge, technology and products developed, at a time when global R&I race accelerates.

We call on the EU Institutions and Leaders to strengthen the R&I investment at European level and urge them to raise the budget of the next EU Programme for R&I (2021-2027), Horizon Europe, to at least €120 billion. Even though a greater amount would be needed to solve the big challenges mentioned above and match the programme's ambitions, this commitment would give the right signal to boost the public and private R&I investment in Europe. It would also demonstrate Europe's leadership to rise to the challenges ahead. The European R&I community is fully committed in playing its part together with societal actors.

Brussels, 22 July 2019

Statement drafted by the following organisations:



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Annual Report 2018-2019

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