



The 17<sup>th</sup> SEFI Mathematics working Group Seminar

23<sup>rd</sup> - 25<sup>th</sup> June, Dublin, Ireland

## Proceedings

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Jointly organised by the Institute of Technology Tallaght, the Dublin Institute of Technology and the Institute of Technology Blanchardstown



SEFI is the largest network of higher engineering education institutions (HEIs) and educators in Europe. It is an international non profit organisation (scientific society) created in 1973 to contribute to the development and improvement of higher engineering education (HEE) in Europe, to reinforce the position of the engineering professionals in society, to promote information about HEE and improve communication between teachers, researchers and students, to reinforce the university-business cooperation and to encourage the European dimension in higher engineering education. Through its membership composed of HEIs, academic staff, students, related associations and companies, SEFI connects over 1 million students and 158000 academic staff members in 48 countries. To fulfill its mission and objectives, SEFI implements diverse activities such as Annual Conferences, Ad hoc seminars/workshops organised by its thematic working groups, organises specific activities for the Engineering Deans, publishes a series of Scientific publications (European Journal of Engineering Education) and Position Papers, is involved in European projects, cooperates with other major European and international associations and international bodies. SEFI also participated in the creation of engineering organisations and networks such as ENAEE, IFEEES, Euro-Pace, IACEE and more recently of the first “European Engineering Deans Council”, EEDC, and of the International Institute for the Development of Engineering Academics, IIDEA. SEFI acts taking into account a series of values: Creativity and professionalism, engagement and responsibility, respect for diversity and different cultures, institutional inclusiveness, multi-disciplinarity and openness, transparency and sustainability.

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SEFI receives the financial support of its corporate partners:



## Introduction

It is one of the main goals of SEFI's Mathematics Working Group to provide a forum for the exchange of views and practices regarding the mathematical education of engineers in Europe. The main means for pursuing this aim is to hold a seminar at an attractive place in Europe every second year. In 2014, we hold the seminar in Dublin because there is a very strong and active Irish community of lecturers interested in the mathematical education of engineers.

Since the last seminar in Salamanca, Spain, in 2012, there was one major achievement which is the third edition of the group's curriculum document which is called "[A Framework for Mathematics Curricula in Engineering Education](#)". This document is based on the concept of mathematical competence which is defined as the ability to master the mathematical challenges in situations where mathematics could be helpful. Besides helping in setting up mathematics curricula, the document is also meant to summarize and provide links to former seminar contributions which dealt with important topics in the mathematical education of engineers. The document can be freely downloaded from the group's web site at <http://sefi.htw-aalen.de>.

The group's 17<sup>th</sup> seminar in Dublin will further discuss the competence concept and other important issues. The response to the corresponding call for papers was very satisfying such that a rich programme resulted from this call which is reflected in the proceedings of the seminar.

There are three invited speakers two of which report about different aspects of the use of technology. Schramm presents a minimum requirement catalogue for beginning students and how students can be supported to check and improve their competence regarding this catalogue by using web technology. Sangwin provides the "big picture" of 400 years of educational technology. Moreover, Joyce gives an industry view of the mathematical education of engineers.

The paper presentations are grouped in seven sessions:

1. Competencies and Attitudes
2. Transition from School to University - Offerings for Students with Deficits and for Bright Students
3. Projects
4. Support Measures
5. Teaching/learning Methods
6. Using Technology
7. Assessment.

Moreover, there are special discussion sessions on the topics:

- What are the important issues in the mathematical education of engineers?
- How can we use technology to improve teaching and learning?

The programme is completed by software demonstrations and poster presentations giving a rich overview of tendencies and developments all over Europe. Most contributions are accompanied

by a paper in the proceedings such that the latter provide an excellent summary of the topics dealt with at the seminar. The author would like to cordially thank the local organizers for doing the language editing that makes the proceedings much more readable.

Aalen, June 2014

Burkhard Alpers

## Editors

Dr Burkhard Alpers (HTW Aalen Germany)

Dr Michael Carr (Dublin Institute of Technology Ireland)

Dr Marie Demlova (Czech Technical University Czech Republic)

Dr Tommy Gustafsson (Chalmers University of Technology Sweden)

Prof. Duncan Lawson (Newman University UK)

Dr Brita Olsson-Lehtonen (Finland)

Dr Carol Robinson (Loughborough University UK)

Dr Paul Robinson (IT Tallaght Ireland)

Dr Daniela Velichova (Slovak University of Technology in Bratislava, Slovakia)

The Editors wish to thank the **Local Organizers** Pat Carroll, Cormac Breen, Martin Marjoram, Damien Cox and Ciaran O'Sullivan for their work as language editors for this proceedings.

## Editor's Note

Each Title in the programme below can be clicked to open a pdf file of that talk

17TH SEFI MWG SEMINAR Mathematical Education of Engineers, Dublin, June 23<sup>rd</sup> - 25<sup>th</sup>, 2014

**Sunday 22/6/2014**

Time	Location/Venue	Event	
20.00 – 21.00	Capital Grafton Hotel Lobby	Informal gathering of delegates	Meet in the lobby and move to a venue playing some music.

**Monday 23/6/2014 Location: DIT Aungier Street**

Time	Room	Event	
9:00 – 10:00	Foyer	Registration/Coffee	Foyer 3 <sup>rd</sup> floor
10:00 – 10:10	3067	Conference Launch by Brian Norton (President of DIT)	
10.10 – 11.00	3067	Keynote Lecture 1 <a href="#">A minimum requirement catalogue for beginners - Using technology for supporting and testing students</a>	Schramm, T
11:00 – 11:20	3067	Paper Presentations: SEFI MWG – Current and Future Work <a href="#">SEFI Mathematics Working Group</a>	Alpers, B et al.
11:20 – 11:40	Foyer	Tea/Coffee	
11:40 – 12:20	3067	Paper Presentations: Competencies and Attitudes	
11:40 – 12:00	3067	<a href="#">Mathematics: Creating Value for Engineering Students</a>	Goold, E
12:00 – 12:20	3067	<a href="#">Teaching and learning with Learning Outcomes for mathematical competencies</a>	Gavalcová, T
12:20 – 13:10		Groups Discussion on “What are the important issues in the mathematical education of engineers?”	
12:20 – 13:10	3067	Group 1 discussion	
	3045	Group 2 discussion	
	3044	Group 3 discussion	
	3083	Group 4 discussion	
13:10 – 14:10	Courtyard Restaurant	Lunch	
14:10 – 14:40	3067	Plenary Discussion on “What are the important issues in the mathematical education of engineers?”	
14:40 – 16:20	3067	Paper Presentations: Transition from School to University – Offerings for Students with Deficits and for Bright Students	
14:40 – 15:00	3067	<a href="#">Interpreting A-level Mathematics grades – as easy as A, B, C?</a>	Cole, J
15:00 – 15:20	3067	<a href="#">Foundation Year Engineering Mathematics. The triple identity crisis.</a>	Steele, C
15:20 – 15:40	3067	<a href="#">How to evaluate bridge courses? – The risk of false positives</a>	Gläser, K/Riegler, P
15:40 – 16:00	3067	<a href="#">University Students Are Changing – And What about Bright Students?</a>	Demlova, M
16.00 – 16.20	3067	<a href="#">Consequences of using technology in mathematics education</a>	Schwenk, A/Kalus, N
16:20 – 17:00	Foyer	Posters and Tea/Coffee	

Poster presenters will have 2 minutes to present their poster. We will then move to the poster display area where presenters can discuss their work over tea and coffee.

(Poster presenters may like to put a photo of themselves on their poster display.)

## Monday 23/6/2014 (continued) Location: DIT Aungier Street

Posters 16.20 – 17.00	
<a href="#">What is troublesome knowledge in Mechanics for mature students?</a>	Mathias, J & Nolan, S
<a href="#">Future Technology for Engineering Maths</a> (Presented as Paper)	Fradkin, L
<a href="#">Lehren Kolleg: Transferring Reform Approaches in Mathematics for Engineers</a>	Landenfeld, K; Roegner, K & Thiele, K
<a href="#">Active/retroactive feedback in continuous assessment of mathematical competencies</a>	Mínguez, F & Sánchez Ruiz, L.M
<a href="#">Investigating engineering students' mathematical problem solving abilities from a models and modelling perspective</a>	Jahan, T; Wedelin, D; Adawi, T & Andersson, S
<a href="#">Benefits of cross modular tutorials for first year students</a>	Carr, C
<a href="#">Lagrange Multipliers as Quantitative Indicators in Economics</a>	Meznik, I
<a href="#">Developing mathematics support for first-year engineering students with non-traditional mathematics backgrounds</a>	Cole, J
<a href="#">Linear algebra at work: simulating multibody systems</a>	Junglas, P
<a href="#">Teaching Mathematics to Third-level Students with Neuro-Developmental Conditions</a>	Venkova, M & McGarraghy, S

17:00 – 18:00 3083/3084/3067 Software Demonstrations – Parallel Sessions			
17:00 – 17:30	3083	<a href="#">Tree-Structured Online Mathematics Exercises For Civil Engineering Students</a>	Mei, I et al.
17:35 – 18:00	3083	<a href="#">Activity "Lesson" on Moodle for the teaching and learning of mathematics to engineers</a>	Caridade, C & Faulhaber, M
17:00 – 17:30	3084	<a href="#">Learning analytics and learning tribes</a>	Lehtonen, K
17:35 – 18:00	3084	<a href="#">Easing the transition to higher education for adult learners in an Access to Engineering course</a>	Cronin, A
17:00 – 17:30	3067	<a href="#">Software demonstration by MapleSoft</a>	Smith, J Perera, S
17:35 – 18:00			

Time	Location/Venue	Event
19.00 – 20.00 +	Dublin Castle	Reception with Minister Joan Burton
		Arabic Mathematics at the Chester Beatty Library a talk by Ms Fionnuala Croke, Director of the Chester Beatty Library

**Tuesday 24/6/2014**

**Location: IT Tallaght**

Delegates will be brought from Aungier Street to IT Tallaght by bus (40minutes).

Buses will leave Aungier Street at 8am.

Time	Room	Event	
9:00 – 9:05		<b>Welcome by Pat McLaughlin, President of IT Tallaght</b>	
9:05 – 9:10		<b>Introduction of Keynote Speaker by John Power, Director of Engineers Ireland</b>	
9.10 – 10.00	025	<b>Keynote Lecture 2</b>	
		<a href="#">The End Product of Engineering Practice Depends on Society Understanding the Maths!</a>	Joyce, T
10:00 – 11:00	040	<b>Parallel Paper Presentations: Projects</b>	
10:00 – 10:20	040	<a href="#">Signal reconstruction as project work in Electrical Engineering</a>	Schott, D
10:20 – 10:40	040	<a href="#">Has the introduction of “Project Maths” at post-primary level affected the mathematical skills and attitudes of first-year higher education engineering students in Ireland?</a>	Nahari, N
10:40 – 11:00	040	<a href="#">To see Mathematics as Useful</a>	Richtáriková, D
10:00 – 11:00	054	<b>Parallel Paper Presentations: Support Measures</b>	
10:00 – 10:20	054	The Role of Centres of Excellence in Enhancing the Learning of Mathematics in Higher Education	Lawson, D
10:20 – 10:40	054	<a href="#">An Analysis of Maths Learning Support for Mature Students in Engineering: Engagement and Effect</a>	Breen, C/Carr, M
10:40 – 11:00	054	<a href="#">Mathematics and Statistics Support – the Experience of the sigma Network</a>	Fletcher, L
11:00 – 11:20	Foyer 025	<b>Tea/Coffee</b>	
11:20 – 12:20	040	<b>Parallel Paper Presentations: Teaching/Learning Methods</b>	
11:20 – 11:40	040	<a href="#">Self-Organized Learning in Mathematical Education of Engineers</a>	Schmidt-Gröttrup, M
11:40 – 12:00	040	<a href="#">How does Problem Based Learning fit with Cognitive Load Theory?</a>	Peters, M
12:00 – 12:20	040	<a href="#">Feedback and formative assessments in mathematical lectures</a>	Thiele, K/Bender, G
11:20 – 12:20	054	<b>Parallel Paper Presentations: Using Technology</b>	
11:20 – 11:40	054	<a href="#">Mixing campus based and online streaming services in the mathematics education for engineering students</a>	Fredriksen, H
11:40 – 12:00	054	<a href="#">Application of Instructional Design in a b-Learning course of mathematic for engineers</a>	Caridade, C & Faulhaber, M
12:00 – 12:20	054	<a href="#">From The Individual Towards The Collective</a>	Beban-Brkic, J
12:20 – 12:30	025	<b>Nomination of next SEFI MWG chair person</b>	
12:30 – 13:10	Staff Dining Room	<b>Lunch</b>	
13:10 – 18:00		<b>Excursion to Glendalough</b>	

Time	Location/Venue	Event
19.45 – 23.00	Fallon and Byrne	Conference Dinner

Wednesday 25/6/2014

Location: DIT Aungier Street

Time	Room	Event	
9.10 – 10.00	3067	<b>Keynote Lecture3</b>	
		<a href="#">400 years of educational technology</a>	Sangwin, C
10:00 – 10:50		<b>Group Discussion: How can we use Technology to Improve Teaching and Learning?</b>	
10:00 – 10:50	3067	Group 1 discussion	
	3045	Group 2 discussion	
	3044	Group 3 discussion	
10:50 – 11:10	Foyer	<b>Tea/Coffee</b>	
11:10 – 11:40	3067	<b>Plenary Discussion: How can we use Technology to Improve Teaching and Learning?</b>	
11:40 – 13:00	3067	<b>Paper Presentations: Assessment</b>	
11:40 – 12:00	3067	<a href="#">Using Student Performance in the Quality Control of Assessment</a>	Roegner, K
12:00 – 12:20	3067	<a href="#">E-assessment and mathematical learning: A Spanish overview</a>	Garcia, A et al
12:20 – 12:40	3067	<a href="#">ACAM - Competency Assessment/Improvement Actions: Diagnose to guide</a>	de Almeida , B et al.
12:40 – 13:00	3067	<a href="#">Mathematical preparedness of engineering students who transfer from an Ordinary degree into an Honours degree</a>	Carr, M et al
13.00 – 13.10	3067	<b>SEFI MWG 18 in 2016 Presentation and Closing</b>	
13:10 – 14:00	Foyer	<b>Buffet Lunch</b>	