MODERNISATION OF ENGINEERING EDUCATION BY THE NETWORK OF HEIS FOR AUTOMOTIVE INDUSTRY

Maria Kocsis Baán

Cooperation between higher education, research institutes and automotive industry section

Hungarian Academy of Science
Budapest, 31 January 2014

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Content

- Modernisation of engineering HE - Why? What? How?
- Best practice examples – exploration and exploitation of opportunities and resources
  - EU Lifelong Learning projects
    - Networks of HEIs
    - University-Business cooperation, role of professional organisations
  - Open Educational Europa – initiative of European Commission
  - ERASMUS+
- Expected outcomes of the sub-project – gateway portal for sharing information and experiences, networking
- Conclusions

Modernisation of engineering education - Why?

- World-wide recognition of Hungarian scientists and engineers – do we need changes at all?
- Factors of competitiveness
- Feedback from Industry – can we /should we reflect on their needs?
- New challenges, changing priorities in engineering practice
  - Internationalisation
  - Globalisation
  - Incredible speed of technological development
  - Versatility of needs… and many more…

Engineering: Issues, Challenges and Opportunities for Development

UNESCO Report, published in 2010

- **New model of International Education of Engineers**
- ***The need for a change in engineering education***
  - Increasing demand for engineers who are able to work anywhere in the world and who can work on global engineering projects and problems.
  - Changing priorities in engineering practice will require corrections and perhaps more fundamental and painful transformations of educational programmes, the profiles of teaching faculty, and the organizational structures of institutions.
- ***The potential is given by:***
  - the number of academics and universities with international experience in engineering and engineering education;
  - the volume of knowledge and lessons learned from international engineering projects;
  - the technologies available to facilitate international education; and
  - the growing experience with international students and the exchange of students and teachers.

WHAT?

- Professional content
- Range, level and deepness of required knowledge and/or competences at BSc, MSc level
  - „What should the proportions of general and specialist technological knowledge be?
  - What should the proportions of technological and nontechnological knowledge be (including economics, management, ethics, humanitarianism) for a modern engineer?” UNESCO Report
- Diversity of competencies to be gained for working at
  - a multinational firm – team work, multicultural competencies, management skills
  - an SME – independency and creativity, practice oriented and applicable knowledge on the specific field.

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What or HOW to teach?

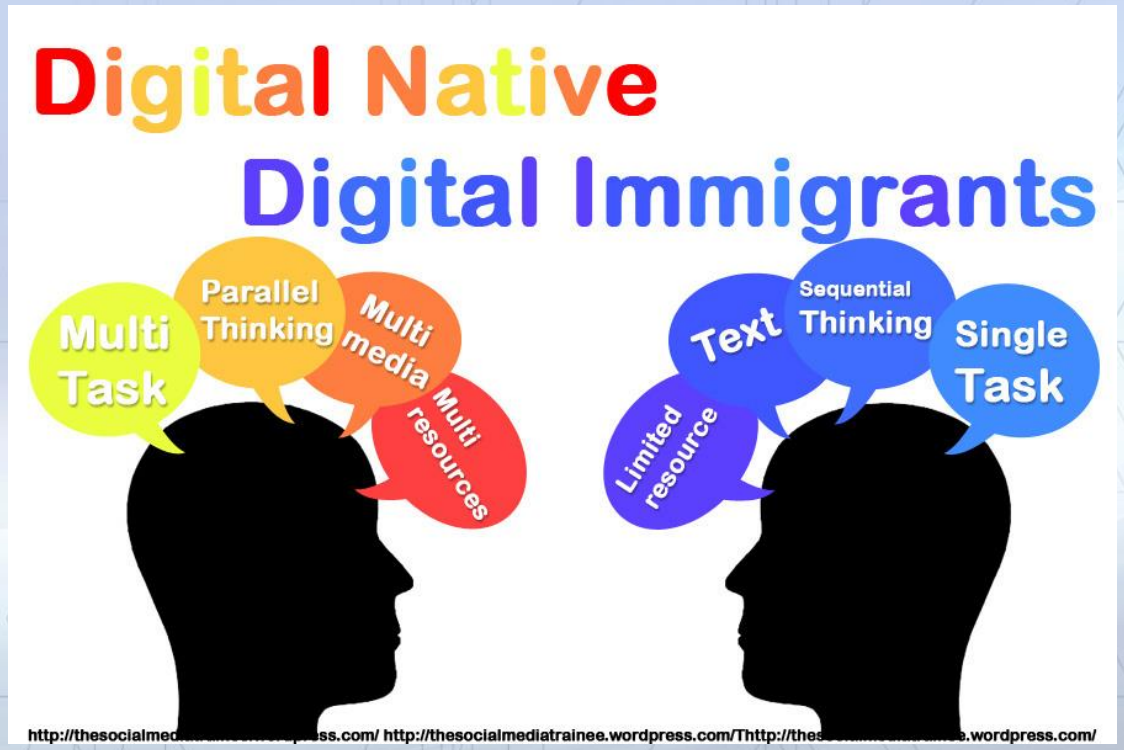
- Could we define **what knowledge our students need for their whole professional carrier** – i.e. from graduation till 2050 or further?

Evidently NOT – so why we focus on WHAT to teach, and why not on HOW to teach them for being prepared for

  - Following the change, the dynamic development,
  - Finding, selecting, understanding, interpreting and applying the information available in several resources?

- Is teaching „transfer of knowledge”?
- Are teachers the „sources” and „broadcasters” of transferable knowledge or rather the facilitators of learning?
- Can we use „old-style” educational technologies effectively for teaching the Digital Native generation?

What is the difference?



- Are we prepared for changes?
- And are we inspired/motivated?

If yes, here are some guides/helps

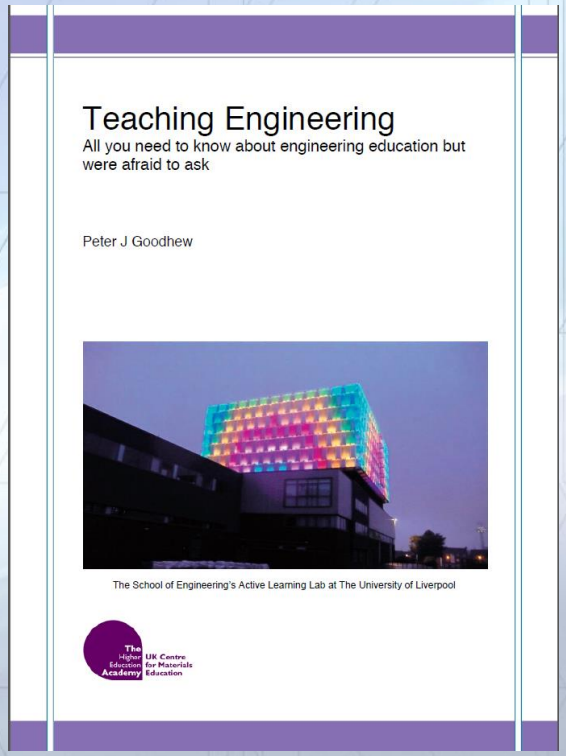
Teaching Engineering

All you need to know about engineering education but were afraid to ask

- By Peter Goodhew

former Director of UK Centre for Materials Education

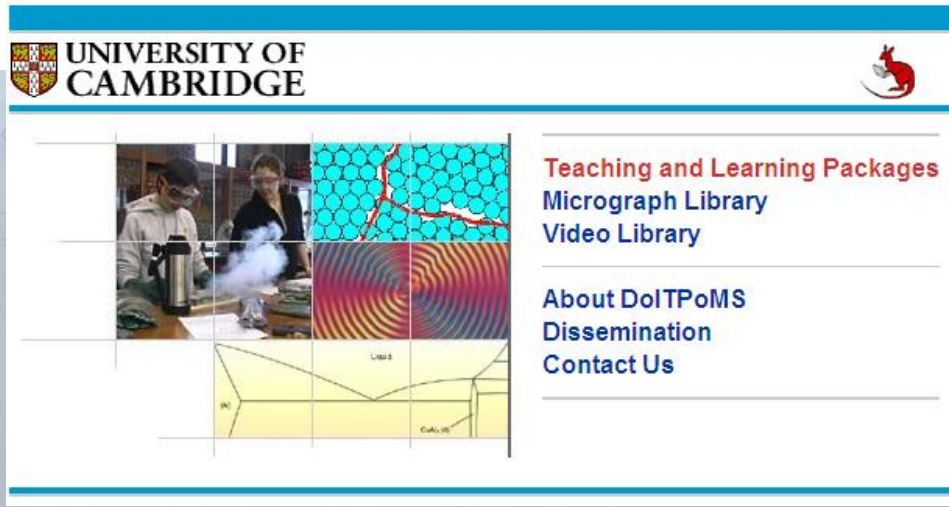
2010



download:

http://www.materials.ac.uk/

Gateway Portals for further resources



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Open Educational Resources

CORE-Materials

COLLABORATIVE OPEN RESOURCE ENVIRONMENT – FOR MATERIALS

OER Open Educational Resources

HOME | ABOUT | MATERIALS & REPORTS | CONTACT | HELP | RESOURCE FINDER

Latest News

Resources on Novel Materials, including quasicrystals from AMES Lab

Materials breakthrough - resources on graphene added

Forming and Testing Techniques for Composite Materials

Have you seen...?

Animation of aluminium extrusion process

Restoring a tooth video

The role of technology in sporting performance lecture

User comments

"Thank you for the CC license, I used this for an article, on www.labgrab.com. Great image." LabGrab on Flickr

"Thank you for help me to understand this technique. Reading about it just wasn't enough to really understand it. Great narration and nice camera work!" mapple34 on YouTube

"WOW! I could have saved an entire 12 hour day had I found this first," inventorgrissom on SlideShare

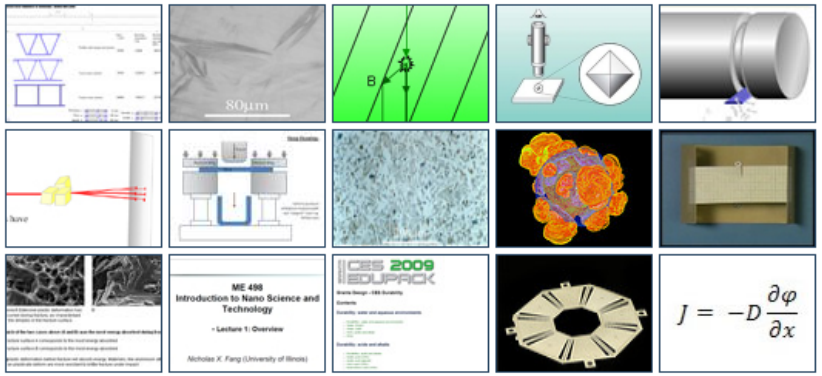
Follow us on...

The CORE-Materials repository contains 1662 open educational resources (OERs) in Materials Science and Engineering, freely available under a range of Creative Commons licenses. It currently contains:

- 25 datasets
- 937 images
- 226 interactive resources
- 1 software
- 1 sounds
- 175 texts
- 55 presentations
- 160 videos/animations
- 50 equations
- 2 external websites

It also contains 132 copyrighted resources, which you might find useful.

I'm looking for resources on [ ] Go leave blank to see all resources



Click on the images to view resource details

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Materials Education Symposia – and many more…

Materials Education Symposia

2014 Symposia

- Home
- Organization
- Call for Abstracts
- Themes
- 5th N. American Symposium
- 6th International Symposium
- 1st Asian Symposium
- Previous Symposia
- Contact Details

Key events for materials educators in undergraduate engineering, design, and science

Main Theme: 'Materials, Systems, Innovation, & Sustainable Development'

Poster allocations now being made: final submission deadline Feb 15 »

Confirmed participants include: John Abelson (UIUC), Mike Ashby (Cambridge), Yves Bréchet (INP-Grenoble), Rudolph Buchheit (Ohio State), Bill Callister (Utah), David Embury (McMaster), Peter Goodhew (Liverpool), Mark Miodownik (UCL), Srinivasa Ranganathan (IISc Bangalore), and Rick Sisson (WPI).

Event details	Presentations	Details and Registration
5th North American Materials Education Symposium University of Illinois at Urbana-Champaign, March 20-21, 2014	**Speaker Program »**	Here »
6th International Materials Education Symposium University of Cambridge, UK, April 10-11, 2014	**Speaker Program »**	Here »
1st Asian Materials Education Symposium National University of Singapore, Dec 11-12, 2014	**Call for abstracts »** (by May 31, 2014)	Here »

Education

- Overview
- CES EduPack
- Teaching Resources
- Events & training
- Granta for research
- Background
- Support & FAQ
- Interact with Granta

GRANTA CES 2013 EDUPACK

- INFORMATION PACK AND PRESENTATION
- SEE A DEMONSTRATION

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Open Education Europa

Courses

Filter by Subject:
- Social sciences (101)
- Applied sciences (76)
- Science and technology (73)
- Humanities (69)
- Mathematics and statistics (42)
- Natural sciences (34)
- Business (26)
- Arts (13)

Filter by Level
- Higher Education (364)
- Vocational Education and Training (93)
- Adult Learning (70)
- Secondary (31)
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Filter by Language:
- English (213)
- Spanish (57)
- French (25)
- German (23)
- Dutch (14)
- Portuguese (14)
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- Finnish (6)
- Polish (6)
- Slovak (5)
- Estonian (4)
- Hungarian (4)
- Latvian (4)
- Czech (1)
- Greek (1)
- Maltese (1)

Filter by License
- Not acknowledged (186)
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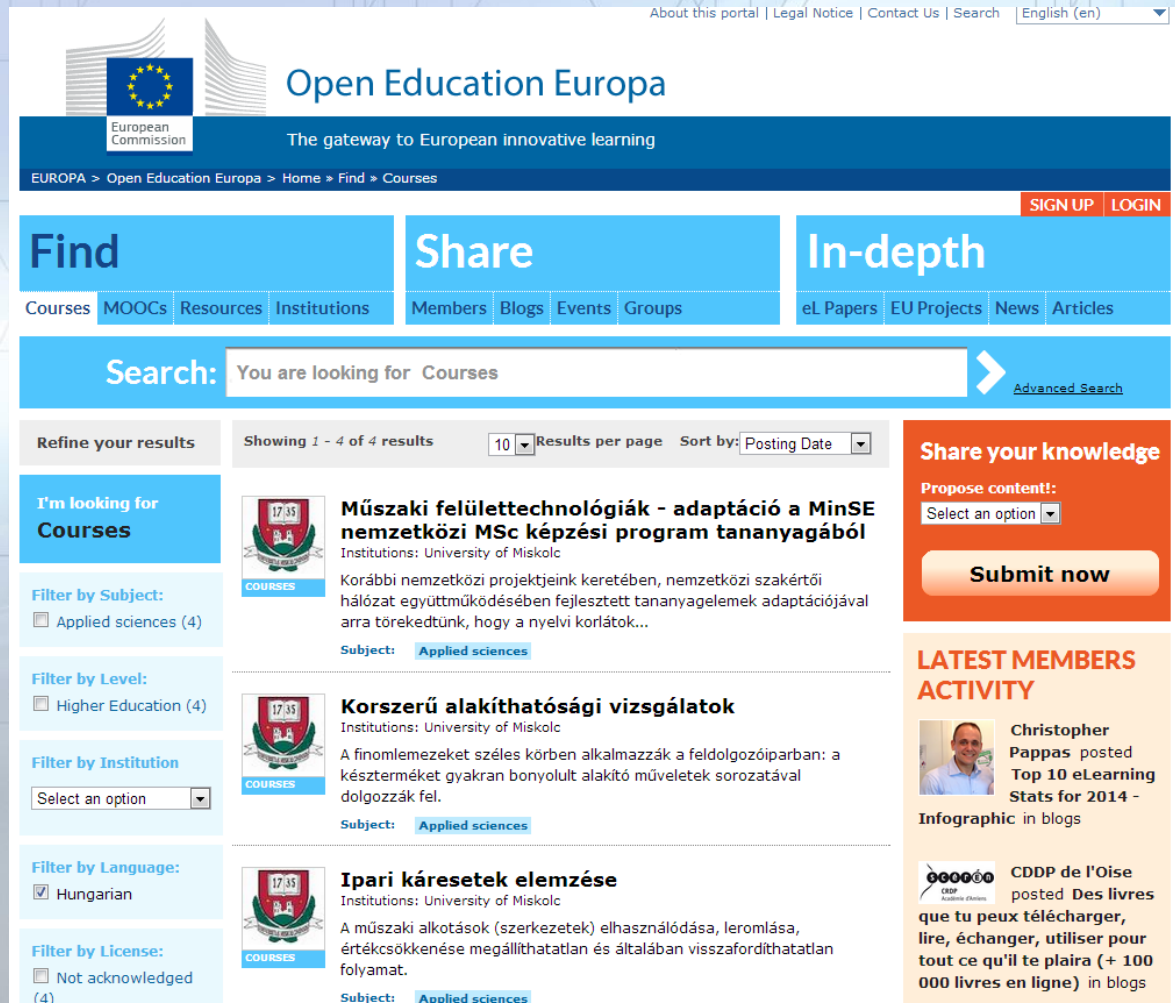
- Attribution



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European projects in engineering fields

- **Establishment of new courses on Materials Engineering in Hungary** (1994-97)
- **Innovate** – Surface Engineering (2001-2004)
- **E2ngineering** – MatSci and CAE, (2004-2006)
- **MinSE** – Heat Treatment & Surface Engineering (2006-2009)

Education and Culture
Lifelong Learning Programme
ERASMUS

e²ngineering

MinSE
International Masters in Heat Treatment & Surface Engineering

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Common strengths, innovative aspects

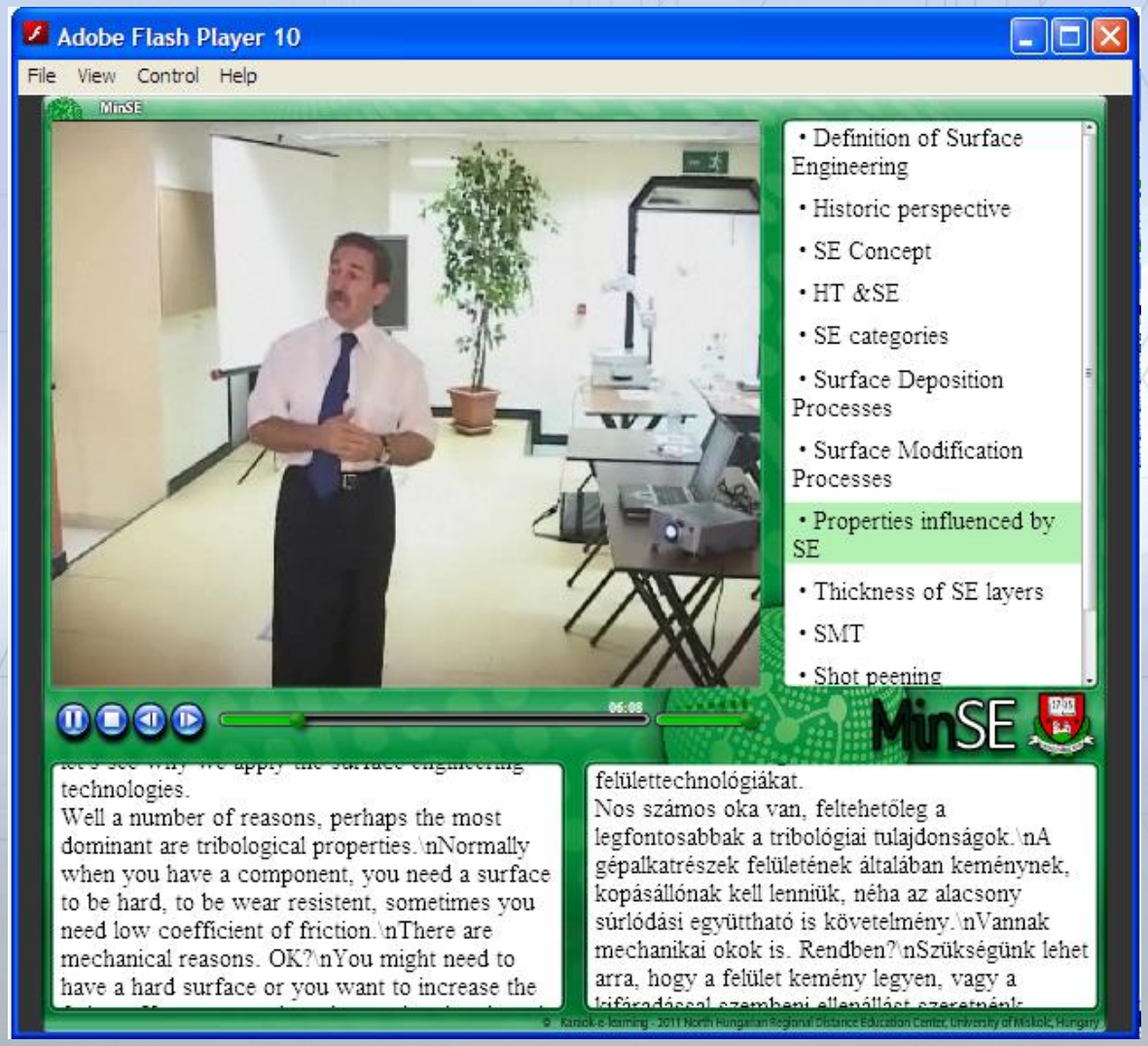
- International **networking models**,
- **Multilingual delivery** of the content – versatile, simultaneous language support
- **Resource based** approach in course development
- Developing training materials in modular structure – **reusable learning elements**, as building blocks of different learning programmes – a „LEGO” system of course development

Gradual, step-by-step investment,
continuous improvement
Cost effectiveness - remixing of existing,
shared resources

Examples of learning elements – edited video-lectures

Presentation of late Prof. Tom Bell, University of Birmingham

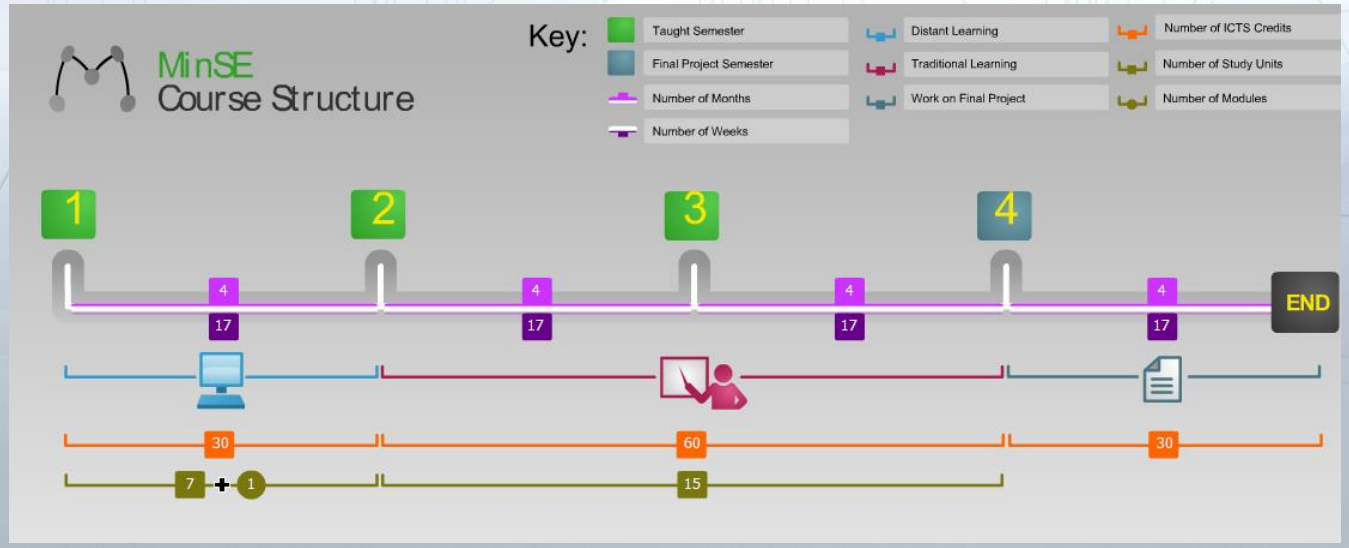
Video-lecture - subtitled in English and Hungarian



Prof. Maurice Grech,
University of Malta
Co-ordinator of MinSE project

University-Industry partnership in MinSE

- Development of a Bologna-conform, accredited, full MSc programme: International Master in Heat Treatment and Surface Engineering
- 5 universities, 5 industrial partners + IFHTSE, (International Federation for Heat Treatment and Surface Engineering – world-wide professional organisation)



MinSE
International Masters in Heat Treatment & Surface Engineering

22 modules, 4 credits for each, offered also as self-standing professional development courses, delivered by international academic staff

Education and Culture
Lifelong Learning Programme
ERASMUS

MinSE in Moodle Learning Management System

Demo accessible for guests: http://edu.uni-miskolc.hu/minse

Synergy with recent EU-projects

- Open Educational Innovation and Incubation

Design of a sustainable organisational interface to improve university- market receptiveness and to improve incubation of educational innovation, e.g. Open Educational Resources, MOOCs

- Simola - Situated Mobile Language Learning

  a mobile and web-based system for situated learners living abroad to record and share experiential learning about their host country's language and culture

- International Internship AGORA – aiming at

  Improving flexibility and internationalisation of practical placement, internship programs

  - for improving the employability of graduates,
  - for strengthening relationship between Higher Education and economy

Education and Culture DG
Lifelong Learning Programme

Opportunities in ERASMUS+

- 2014-2020 - investment in human capital - to support actions, cooperation and tools consistent with the objectives of the Europe 2020 Strategy.

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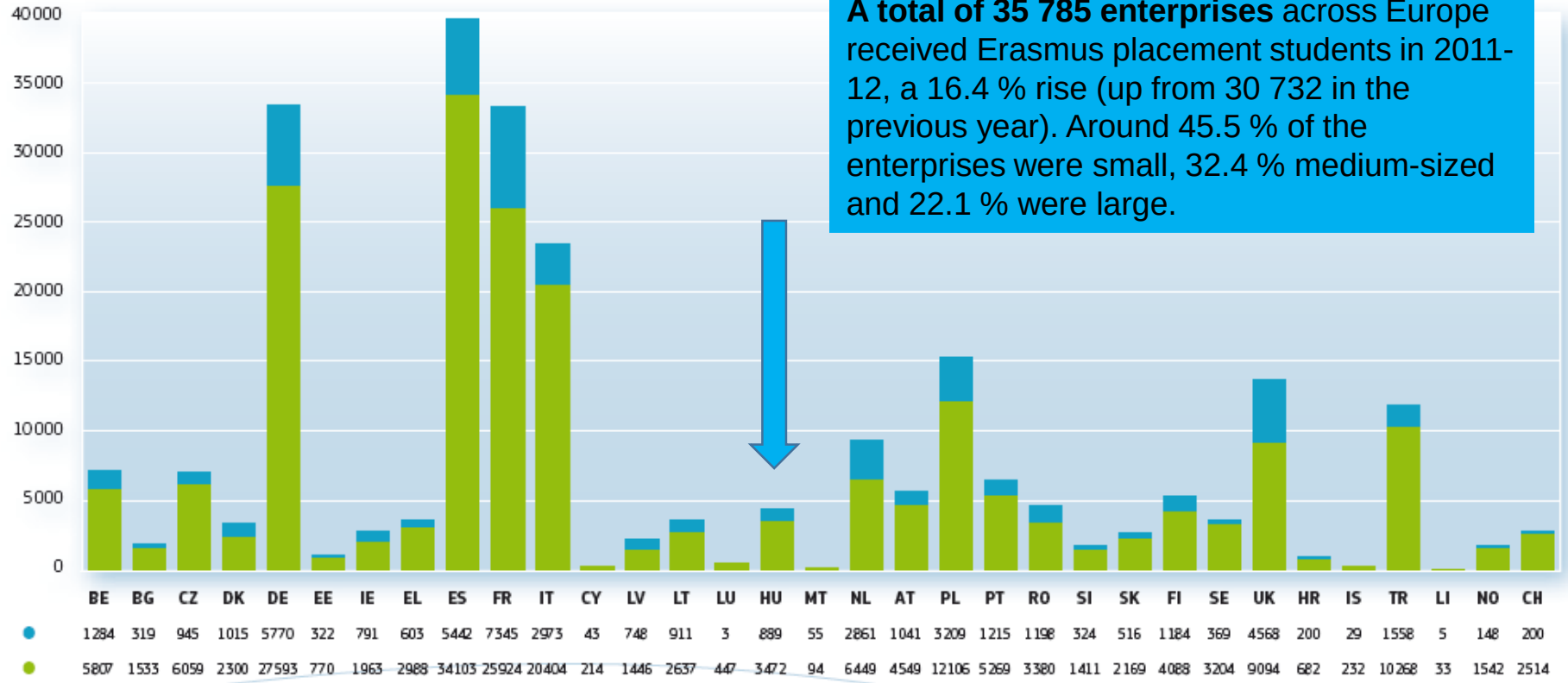
Work placement in ERASMUS (since 2007)

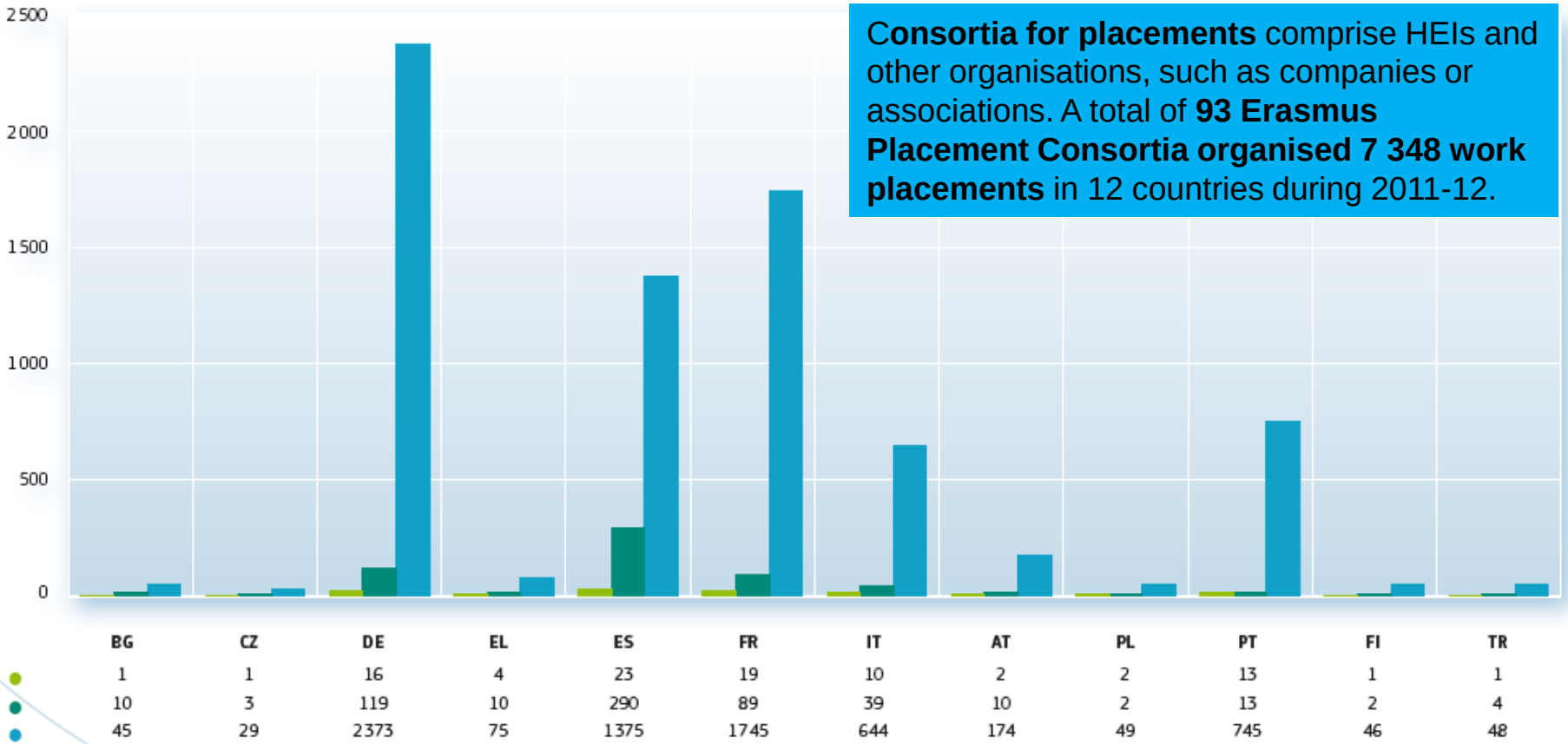
Distribution of outgoing students studying or doing work placements abroad in 2011-12



A total of 35 785 enterprises across Europe received Erasmus placement students in 2011-12, a 16.4 % rise (up from 30 732 in the previous year). Around 45.5 % of the enterprises were small, 32.4 % medium-sized and 22.1 % were large.

New sceme for work placement exchange

Consortia for work placements per country in 2011-12



	BG	CZ	DE	EL	ES	FR	IT	AT	PL	PT	FI	TR
Number of consortia	1	1	16	4	23	19	10	2	2	13	1	1
Number of Higher Education Institutions in consortia	10	3	119	10	290	89	39	10	2	13	2	4
Number of placements organised	45	29	2373	75	1375	1745	644	174	49	745	46	48

Consortia for placements comprise HEIs and other organisations, such as companies or associations. A total of **93 Erasmus Placement Consortia organised 7 348 work placements** in 12 countries during 2011-12.

E-Learning - Everyday practice, not just projects

- Applied materials science – final semester of engineering management BSc course

  Group and individual tasks to find, systematise, analyse information on MS&T in Automotive sector

ERASMUS foreign students learning HT&SE in Miskolc
Remix of learning materials developed in international projects

E-Learning for ALL
- Part-time students
- Work placement
- Social networking

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Synergy with R&D project

Material developments for the automotive industry: fundamental researches in metal forming, heat-treatment and welding

(TÁMOP-4.2.2.A-11/1/KONV-2012-0029)

Total amount of financial support: 473,3 MFt, cca 1,577,770 EUR)

Duration: 01.01.2013.– 31.12.2014.

autotech
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http://www.autotech.uni-miskolc.hu

NEW SZÉCHENYI PLAN

UNIVERSITAS MISKOLCINENSIS
SZE - GYŐR
KECSKEMÉTI FŐISKOLA 2000
bay logi Institute for Logistics and Production Engineering
HUNGARY'S RENEWAL
The project is supported by the European Union and co-financed by the European Social Fund.

Expected outcomes of networking in TÁMOP project

Networking of professionals for

- sharing experiences and resources,
- nucleating collaborative schemes
- enhancing accessibility to valuable information/resources

by offering versatile support and services via a portal,

- as a gateway for provision of reliable information and
- as a virtual meeting point of a professional community to be involved

Target groups - Potential users of the gateway portal

- Learners
- Teachers/educators
- Industry

Elements of the Gateway portal

- Course finders
  - formal (degree courses in B, M, and PhD level) and
  - non-formal (short professional development courses)
- Recruitment of engineering students
- OER database – for informal learning - based on models studied and analysed
- Networking tools for the virtual community of academics
- Good practice examples

All activities will be supported by free, on-line tools, for providing sustainability and cost-effectiveness

Draft design of the Gateway portal

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Conclusions

Should we teach MORE or BETTER?...

…or simply DIFFERENTLY?

- Changing needs and challenges
- Great potential in international networking
  - Networks of HEIs (SEFI, EDEN, EADTU)
  - Professional organisations, Industry
- Effective tools provided by ICT, Educational Technology
- Community of Practice

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Engineers of the future

In order to operate effectively, engineering graduates thus need to possess the following characteristics.

- They will be rational and pragmatic, interested in the practical steps necessary for a concept to become reality.
- They will want to solve problems and have strategies for being creative, innovative and overcoming difficulties by employing their knowledge in a flexible manner.
- They will be numerate and highly computer literate, and capable of attention to detail.
- They will be cost and value-conscious and aware of the social, cultural, environmental and wider professional responsibilities they should display.
- They will appreciate the international dimension to engineering, commerce and communication.
- When faced with an ethical issue, they will be able to formulate and operate within appropriate codes of conduct.
- They will be professional in their outlook, capable of team working, effective communicators, and able to exercise responsibility.'

Engineering Benchmark Statement: QAA, 2006 from „Teaching Engineering" by P.Goodhew

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Paradigm shift in education

- *Educational focus* is shifting from *teacher-centered* to ***student-centered***;
- *Teaching approach* is moving from *lecturing monotonously* to ***facilitating students' autonomous and independent learning;***
- *Learning style* is shifting from *passive learning* to ***active and collaborative learning***

THANK YOU FOR YOUR ATTENTION.

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Web:

COOPERATION BETWEEN HIGHER EDUCATION, RESEARCH INSTITUTES AND AUTOMOTIVE INDUSTRY

TÁMOP-4.1.1.C-12/1/KONV-2012-0002

BASIC RESEARCH FOR THE DEVELOPMENT OF HYBRID AND ELECTRIC VEHICLES

TÁMOP-4.2.2.A-11/1/KONV-2012-0012

"SMARTER TRANSPORT" - IT FOR CO-OPERATIVE TRANSPORT SYSTEM

TÁMOP-4.2.2.C-11/1/KONV-2012-0012

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HUNGARY'S RENEWAL

The projects are supported by the European Union and co-financed by the European Social Fund.

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Budapest, 31 January 2014

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