

## FORUM ON EDUCATION

### EFCE FORUM 2013 - EDUCATION ECCE9 - DEN HAAG, 21 APRIL 2013

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## OUTLINE

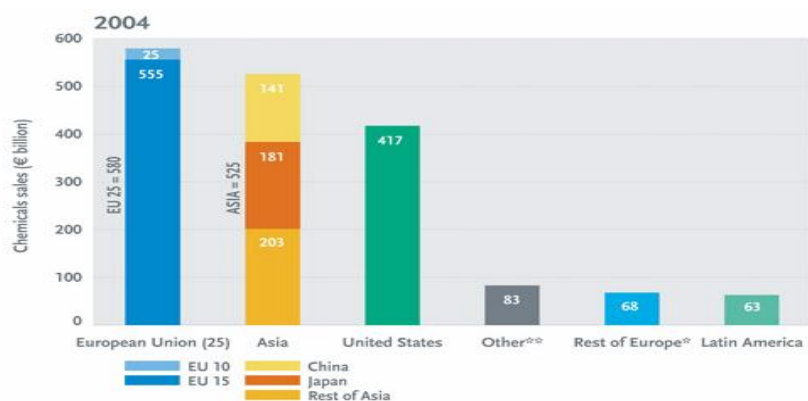
- 👉 Educational goals and needs in a global world
- 👉 Structure of Education in Europe, post-Bologna
- 👉 The substance of chemical engineering education for the world
- 👉 Tools in the information age, in the era of communications
- 👉 A final thought – third paradigm of chemical engineering education, is it so?

## LIFE TODAY A MIX OF CHALLENGES, THREATS AND OPPORTUNITIES

- ☞ **The computer and communications era - dramatic changes of the concepts of time and space - globalisation**
- ☞ **The global market economy - driving today's Societies**
  - **Sharp increase in standards and competition Worldwide**
  - **Volatility of jobs**
  - **Job market and opportunities - wider than ever**
- ☞ **The increase of Expectation of Life vs. Social sustainability – work longer years**
- ☞ **The decrease of knowledge half-time – back to School**
- ☞ **Significant change in the concepts of individual career management, mainly for Young People**

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## LIFE TODAY - PRODUCTION MOVES EAST GEOGRAPHIC BREAKDOWN OF WORLD CHEMICALS SALES - 2004



World chemicals sales in 2004 is estimated at € 1736 billion  
The EU accounts for 33% of the total

Source: Cefic

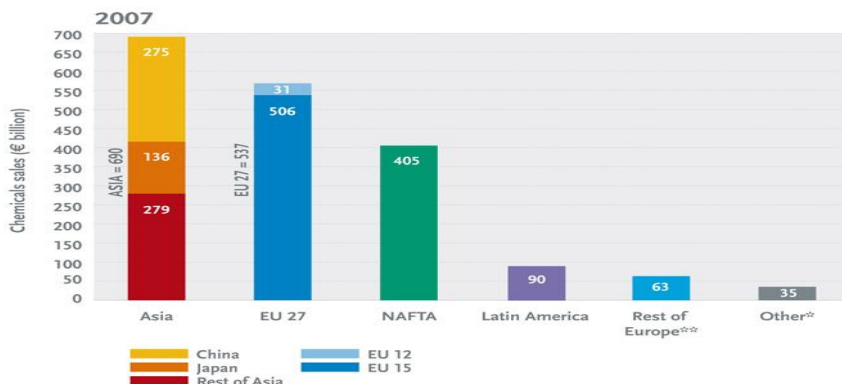
Definition: Rest of Europe\* = Switzerland, Norway, and other Central & East Europe (excluding the new EU 10 countries)  
Other\*\* including Canada, Mexico, Africa & Oceania



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## LIFE TODAY - PRODUCTION MOVES EAST GEOGRAPHIC BREAKDOWN OF WORLD CHEMICALS SALES - 2007

Chart 1.1: Geographic breakdown of world chemicals sales

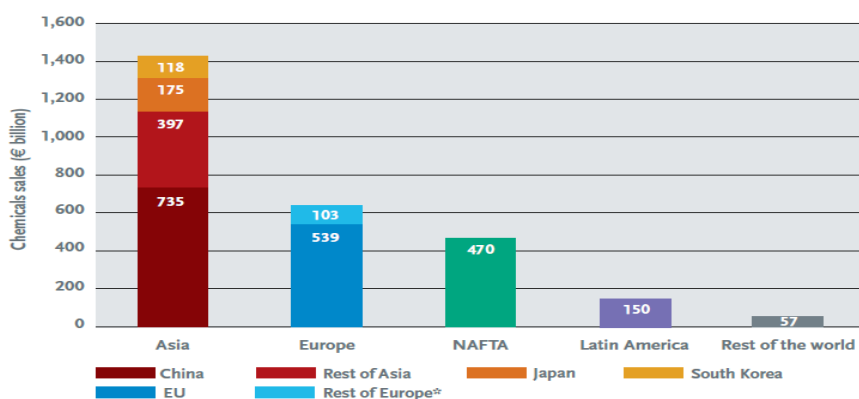


World chemicals sales in 2007 are valued at € 1820 billion  
The EU accounts for 29,5% of the total

Source: Cefic Chemdata International  
Other\* = Oceania and Africa  
Rest of Europe\*\* = Switzerland, Norway and other Central & Eastern Europe  
(excluding the new EU 12 countries)



## LIFE TODAY - PRODUCTION MOVES EAST GEOGRAPHIC BREAKDOWN OF WORLD CHEMICALS SALES - 2011



World chemicals sales in 2011 are valued at €2744 billion. The European Union accounts for 19,6% of the total.

Source: Cefic Chemdata International  
\* Rest of Europe = Switzerland, Norway and other Central & Eastern Europe  
(excluding the new EU-12 countries)

Unless specified, chemicals industry excludes pharmaceuticals  
Unless specified, EU refers to EU-27



## LIFE TODAY ESSENTIAL INSTRUMENTS AND POLICIES FOR THE FUTURE

- ☞ **A global World living in and with a new paradigm of coexistence**
  - ✓ **COOPETITION = COOPERATION + COMPETITION**
- ☞ **That requires**
  - **New management and transnational cooperation policies**
  - **A new cultural paradigm of Education - Lifelong Learning**
  - **Mobility of students and professionals**
- ☞ **Which in turn requires**
  - **Policies and Instruments for recognition of academic and professional qualifications**
  - **POLITICAL WILL**

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## EDUCATIONAL NEEDS IN A GLOBAL WORLD

- ☞ **Universities should widen the students' "scope of thinking"... to the dimension of the Earth... and beyond...**
- ☞ **The need to understand other cultures and backgrounds**
- ☞ **Namely in large global companies, the need to think global – 24/7 – when Asia goes to sleep we start our work, when we go to sleep America start their work**
- ☞ **The need to promote mobility and cooperation, by promoting TRUST**
  - **Develop comparable qualifications frameworks**
  - **Apply quality assurance procedures that are recognised and accepted by all stakeholders**

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## NEW PROGRAMMES IN CHEMICAL ENGINEERING EDUCATION

- ☞ **Revisit and modernize the programme**
  - **Bring in new topics – raise the awareness of new topics**
  - **Incorporate new Knowledge, Competences and Skills**
- ☞ **Bring in new methods for learning – adapted to the available tools and to the cultural evolution of society**
- ☞ **Develop within the institution an International Dimension (not only European) and Culture of Quality through mobility and academic cooperation and interchange**
  - **Prepare programmes for cooperation – Joint Degrees**
- ☞ **Prepare programmes to attract new publics – Lifelong Learning**

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## NEW PROGRAMMES IN CHEMICAL ENGINEERING EDUCATION DESCRIPTORS AT PROGRAMME LEVEL

- ☞ **Recommendations of the WPE-EFCE**
  - ✓ **WPE-EFCE – Working Party on Education – European Federation of Chemical Engineering**
  - ✓ **Developed between 2003 and 2010 an exercise of identification of core learning outcomes and curriculum for chemical engineering – contents and methodologies**
  - ✓ **Adapted to the engineering sectoral qualifications Framework – EUR-ACE**
- ☞ **See EFCE Site and Bologna Recommendations (2010) at**
  - <http://www.efce.info/wpe.html>
  - [http://www.efce.info/Bologna\\_Recommendation.html](http://www.efce.info/Bologna_Recommendation.html)

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## NEW DIRECTIONS FOR CHEMICAL ENGINEERING EDUCATION I – ADDRESS PROBLEMS, ANSWER DEMANDS...

- **New concerns on energy and environment problems and generally on sustainability**
- **Sharp demand for 'performance products' - specialties, food, personal care products...**
- **Functionalized materials....**
- **.....**
- **Process and product development times came down sharply (3 to 5 fold) - risk management...**
- **Technological and scientific developments - new paradigms on Unit Operations open for discussion - micro-systems, process intensification...**
- **.....**

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## NEW DIRECTIONS FOR CHEMICAL ENGINEERING EDUCATION II – INCORPORATE NEW KNOWLEDGE, COMPETENCES AND SKILLS

☞ **Programmes are of course directed to raise scientific and technical knowledge – fundamentals should never be put aside**

**BUT**

- ☞ **Must bring in the development of attitude, skills and competences valued by Industry and Society in general**
- **Skills and competences for innovation and entrepreneurship**
  - **Job related skills**
    - ✓ **Teamwork, Communication, Leadership**
  - **Competencies (How tasks are done)**
    - ✓ **Holistic thinking, self-management, achievement of objectives..**

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## TOOLS IN THE INFORMATION AGE, IN THE ERA OF COMMUNICATIONS

- ☞ **The 'good old days of Moodle' ?**
  - Moodle is indeed and essentially a digital repository system with some capacity for interchange
- ☞ **Google Apps for education?**
  - Google Apps are indeed tools for collaborative study and learning
  - A growing number of universities are going 'Google Apps'
- ☞ **MOOCs – Massive Open Online Courses – Coursera, EdX...**
  - Tools and means for learning through cooperative learning
  - They challenge the educational model... the concept /paradigm of 'constant time- variable learning'
  - Indeed platforms for education without boundaries – a political issue

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## TECHNOLOGIES X TRANSFORMATIVE LEARNING: VIA TOOLS (E.G. GOOGLE APPS)

Exames SDIS 2012 ☆

File Edit View Insert Format Tools Table Help Last edit was made 18 minutes ago by Renato Rodrigues

Normal text Arial 11 B U A

9. Considere o seguinte protocolo de autenticação, onde  $R_A$  e  $R_B$  são identificadores "once-in-a-lifetime" (nonce). Qual das seguintes afirmações é verdadeira?

- O protocolo é vulnerável a ataques por reflexão
- O protocolo é vulnerável a ataques por repetição de mensagens antigas
- O protocolo é baseado em chaves simétricas
  - <http://ass.cs.umass.edu/~shenoy/courses/677/lectures/Lec19.pdf>, slide 5
  - <http://userpages.umbc.edu/~dgorin/1451/security/dcomm/authentication.htm>, ap4.0
  - o gráfico apresenta  $K_{AB}$
- O protocolo é vulnerável porque a primeira mensagem não é encriptada.

10. Nas propriedades ACID, qual das seguintes definições não é válida (AT12 - 04)

- Atomic: se uma transacção não conseguir executar todas as suas operações, algumas das suas operações serão visíveis desde que executadas na respectiva ordem
- Consistent: as transacções não alteram a integridade da estrutura de dados
- Isolated: se duas ou mais transacções estão a executar ao mesmo tempo, o resultado final é o mesmo que executar essas transacções sequencialmente
- Durable: Os efeitos de uma transacção em caso de sucesso (commit) são permanentes

Comments

Anonymous 21:29 13 Jun 2012  
No pdf resumido na pasta da drop parece dizer que esta é a verdadeira. Infelizmente, este protocolo já não existe por ser vulnerável a ataques por reflexão.)

João Alves 21:35 13 Jun 2012  
Na correção, by RMA, a solução é a c)

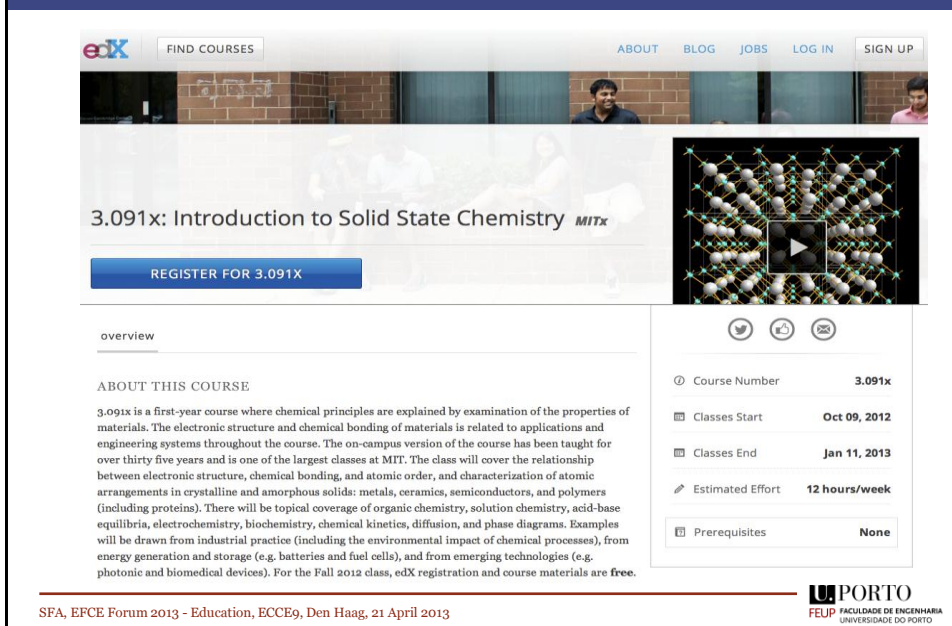
Anonymous 21:38 13 Jun 2012  
wait...

Afonso Rosa 21:41 13 Jun 2012  
é a c), porq temos a certeza absoluta que está correcta, logo é porq o protocolo não deve ser sempre vulnerável a ataques por reflexão

João Anes 21:55 13 Jun 2012  
[http://en.wikipedia.org/wiki/Reflection\\_attack](http://en.wikipedia.org/wiki/Reflection_attack)  
Se foras ver a solução (na wiki), percebes que isto que está na imagem é LITERALMENTE a

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## TECHNOLOGIES X TRANSFORMATIVE LEARNING: VIA CONTENTS (E.G. MOOCs)



edX FIND COURSES ABOUT BLOG JOBS LOG IN SIGN UP

3.091x: Introduction to Solid State Chemistry MITx

REGISTER FOR 3.091X

overview

ABOUT THIS COURSE

3.091x is a first-year course where chemical principles are explained by examination of the properties of materials. The electronic structure and chemical bonding of materials is related to applications and engineering systems throughout the course. The on-campus version of the course has been taught for over thirty five years and is one of the largest classes at MIT. The class will cover the relationship between electronic structure, chemical bonding, and atomic order, and characterization of atomic arrangements in crystalline and amorphous solids: metals, ceramics, semiconductors, and polymers (including proteins). There will be topical coverage of organic chemistry, solution chemistry, acid-base equilibria, electrochemistry, biochemistry, chemical kinetics, diffusion, and phase diagrams. Examples will be drawn from industrial practice (including the environmental impact of chemical processes), from energy generation and storage (e.g. batteries and fuel cells), and from emerging technologies (e.g. photonic and biomedical devices). For the Fall 2012 class, edX registration and course materials are free.

Course Number 3.091x

Classes Start Oct 09, 2012

Classes End Jan 11, 2013

Estimated Effort 12 hours/week

Prerequisites None

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## AT THE END OF THE DAY... A PARADIGM SHIFT IN CHEMICAL ENGINEERING EDUCATION?

### 1st Paradigm(s)

- In general terms - First quarter of the XX Century - Education close to industrial operations - Unit Operations

### 2nd Paradigm(s)

- In general terms – Third quarter of the XX Century – Education shift to Engineering Science

### 3rd Paradigm ???

- We are possibly at present on the process of developing a model and of conceptualizing the evolution for a new paradigm... which is not yet quite identified...



**INSPIRING WORDS ABOUT CHEMICAL ENGINEERING EDUCATION  
WE SHOULD NOT FORGET THE SINE WAVE OF LIFE...**

**☞ The words of A.B. Newman, President AIChE, 1938**

**‘Theoretical descriptions should be limited to illustrate the engineering fundamentals, because a manager does not hire a young engineer just because he is able to describe how a product is produced’.**

**☞ Words of Ralph Landau, Stanford University, 1997\*:**

**‘I believe chemical engineering’s third paradigm, if there is one, is to return the discipline closer to the practices in industry’**

**\* Landau, R. (1997), "Education: Moving from Chemistry to Chemical Engineering and Beyond," Chemical Engineering Progress, AIChE, pp. 52-65**