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BME INFORMATION TECHNOLOGY INNOVATION AND KNOWLEDGE CENTRE

**Budapest University of Technology and Economics
Faculty of Electrical Engineering and Informatics**

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Towards a Common Frame for European CS/Informatics Education

euroTICS 2006

17 October 2006

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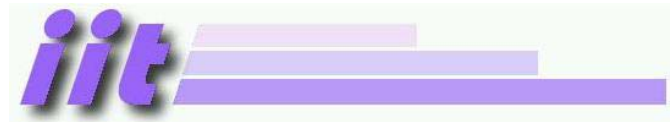
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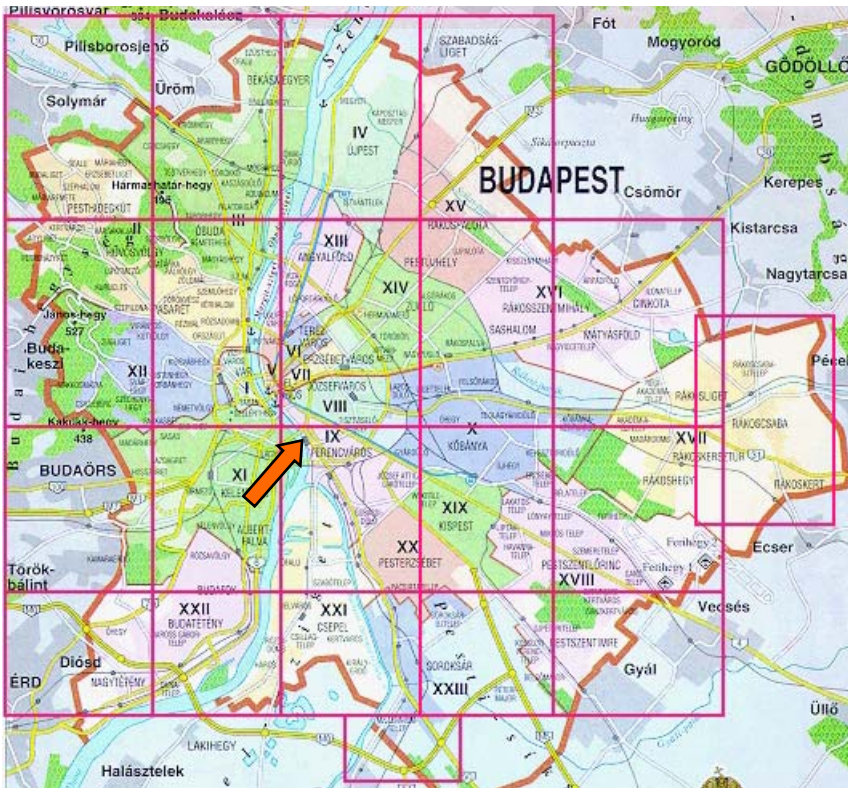


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BME INFORMATION TECHNOLOGY INNOVATION AND KNOWLEDGE CENTRE

BME (Budapest University of Technology and Informatics)



BME facts



- Founded in 1782
- 8 faculties (6 engineering)
- ~ 22 000 students
- ~ 1200 staff-members
- ~ 1500 supplementary employees
- ~ 100 M EUR annual budget (~ 60% from the state, 40% others)

Faculty of Electrical Engineering and Informatics (VIK)

- Founded in 1949 as FEE (VK)
- Education in „Technical Informatics“ started in 1986
- „Informatics“ was added to the name in 1992 FEEI (VIK)
- ~ 5000 students (1/2 EE, 1/2 I)
- ~ 350 staff-members
- ~ 300 supplementary employees
- ~ 300 PhD students
- **BSC system started in 2005**



VIK - Departments



- Automation and Applied Informatics
- Broadband Infocommunications and Electromagnetic Theory
- Computer Sciences and Information Theory
- *Control Engineering and Information Technology*
- Electron Devices
- Electronics Technology
- Measurement and Information Systems
- Power Engineering
- Telecommunications
- Telematics and Media-Informatics

Innovation and Knowledge Centre of Information Technology (IT)²

- Founded in 2005 as a consortium and an organizational unit of the university
- 9 industrial partners (3 multinational, 6 Hungarian small-medium)
- 4 departments from BME (2 VIK, 2 others)
- Budget: ~1,3 M EUR/Year (~90% state, 10% partners)
- Self-sustaining after 3 years
- Research-programs & cross-cutting development-projects



Péter Pázmány program

Established by the support of the National Office for Research and Technology.



Outline



- Bologna-process
 - ◆ Hungarian version
 - ◆ What we need to implement it...
- Informatics – what is it?
 - ◆ An attempt to define it...
- How to compare degree programs in Informatics?
 - ◆ Improved ACM-IEEE-CS CC

Bologna in Hungary (Informatics)

- Origin (informatics)
 - ♦ Science Universities – mathematics
 - ♦ Technical Universities – electrical engineering
- Before
 - ♦ Engineering:
 - 5-year university degree (~MSC)
 - 3-year polytechnic degree (~BSC)
 - Separate institutions, few student-mobility
 - ♦ Science (programming):
 - Universities: 3+2
 - Lower level: 3
- After
 - ♦ 3,5-year (7-semester) BSC (probably unique in the world)
 - ♦ technical informatics, computer programming, business informatics
 - ♦ 2-year MSC

Bologna requirements - 1

“easily readable and comparable degrees”

- What about the number of degrees in EU in informatics?
- How to compare them?

We need

- **definition** for the discipline of informatics

I'll try later

- an **agreement** on a (**small**) number of degrees

- a list of **topics** for each degree
- a list of **outcomes** for each degree

ACM CC seems to be a good basis, I'll propose some improvements later

- (*comparable marking*)

Bologna requirements – 2-3



“two main cycles”

- Change from theory first, specialisation with more practice later to a reverse order education – *with almost the same staff.*
- “The degree awarded after the first cycle shall also be relevant to the European labour market as an appropriate level of qualification.”
- *There should be no difference between BSC degrees of universities and that of polytechnics*

“system of credits”

- ♦ credit is a unit of ???
- ♦ it is the point where ACM – as for me - gave up
- ♦ European Credit System is a goal

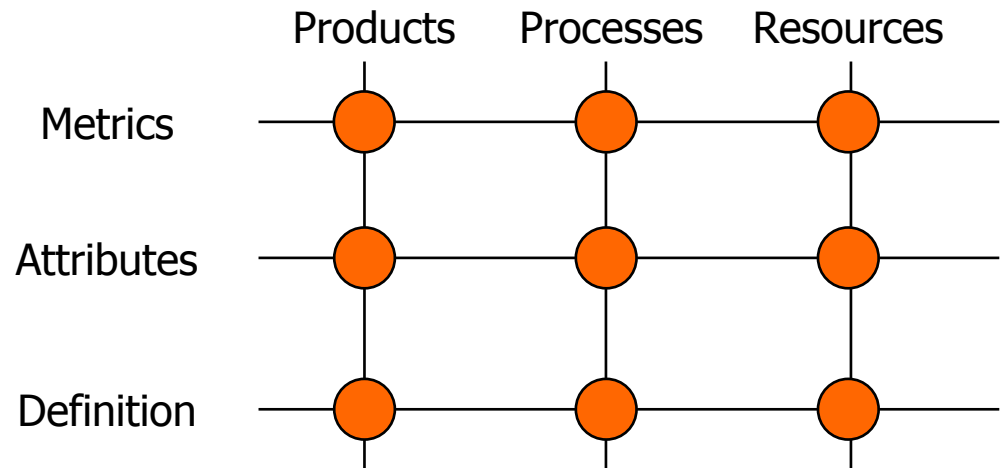
Bologna requirements - 4

“quality assurance”

Should we use ISO or other process-oriented concepts ?

Our proposal: **thinking in the whole quality-frame**

E.g.: Recommendation for the lower bound of necessary resources (staff, infrastructure etc.)....



Informatics – what is it?

- Do we have a definition for Informatics?
- We changed the term (buzzword?) in '80s from computer... to informatics
- From engineering view: ***focus moved from computer to the domain***

Informatics is a field of professional knowledge and skills, subjects of which are:

- **the information itself** (nature of it, metrics for it, representations, data-information-knowledge ...)
- **operations on the information** (processing, transferring, extracting, storing, ...)
- **tools and systems for executing operations on the information** (computers, computer systems, hardware, software, ...)
- **operations on such tools and systems** (design, implementation, maintenance, ...)

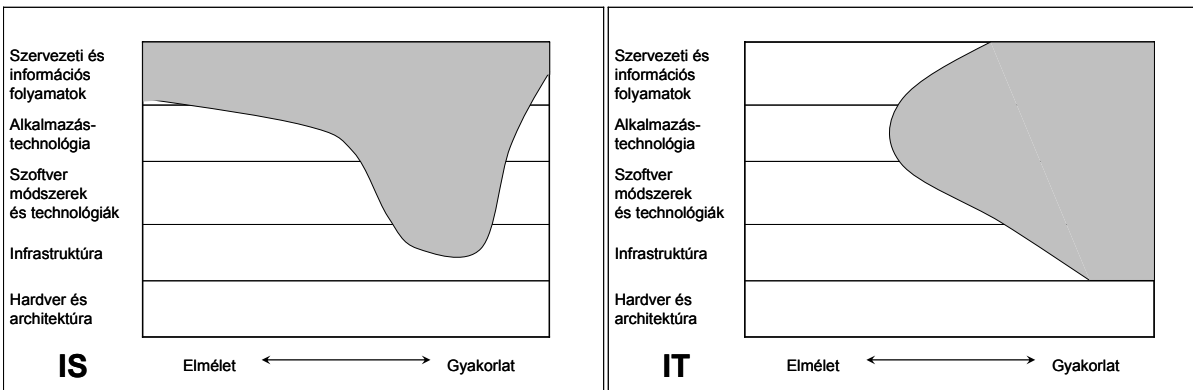
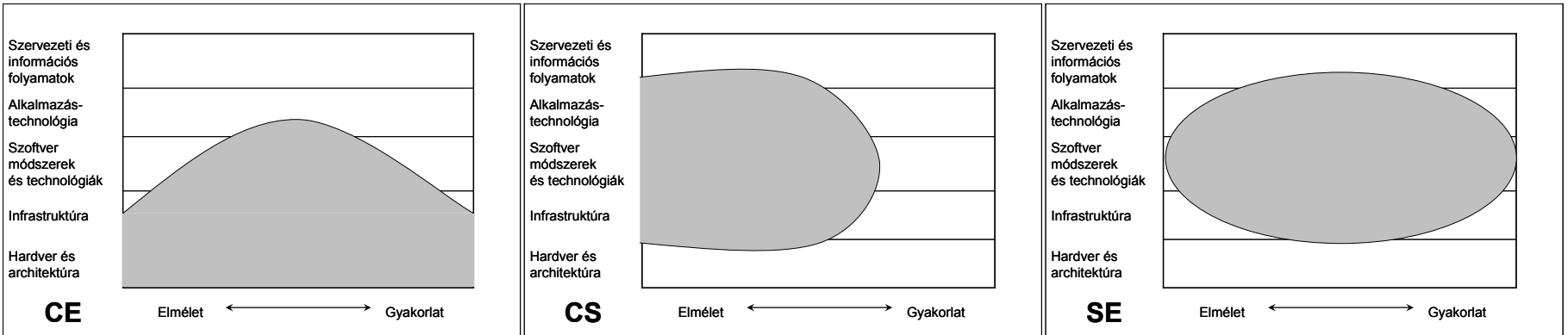
How to compare degree programs?

ACM - IEEE-CS - AIS CC 2005 is a good baseline

Content of the Overview Report:

- ◆ Description of disciplines
- ◆ ***Graphical and tabular comparison***
- ◆ Outcomes
- ◆ Programmes, career opportunities, organisational & curricular models, accreditation
- ◆ US, GB ...

Graphical comparison



Qualitative, based on the consensus of the working-group

Tabular comparison

- Weighting of 36 computing and 21 non-computing topics in different disciplines

<i>Knowledge Area</i>	<i>CE</i>		<i>CS</i>		<i>IS</i>		<i>IT</i>		<i>SE</i>	
	<i>Min</i>	<i>max</i>	<i>min</i>	<i>max</i>	<i>min</i>	<i>max</i>	<i>min</i>	<i>max</i>	<i>min</i>	<i>max</i>
Programming Fundamentals	4	4	4	5	2	4	2	4	5	5
Integrative Programming	0	2	1	3	2	4	3	5	1	3
Algorithms and Complexity	2	4	4	5	1	2	1	2	3	4
Computer Architecture and Organization	5	5	2	4	1	2	1	2	2	4
Operating Systems Principles & Design	2	4	3	5	1	1	1	2	3	4
Operating Systems Configuration & Use	2	3	2	4	2	3	3	5	2	4

- Does not represent the relative weight of topics to each other
- The body of knowledge is described in specific volumes

Experimental visualization



- Curriculum-development at BME VIK
- How to compare our degree program (BSC in technical informatics) to others?
- Requirements:
 - ◆ Impressive visualization
 - ◆ Deliverable from curriculum-tabs

Method of comparison



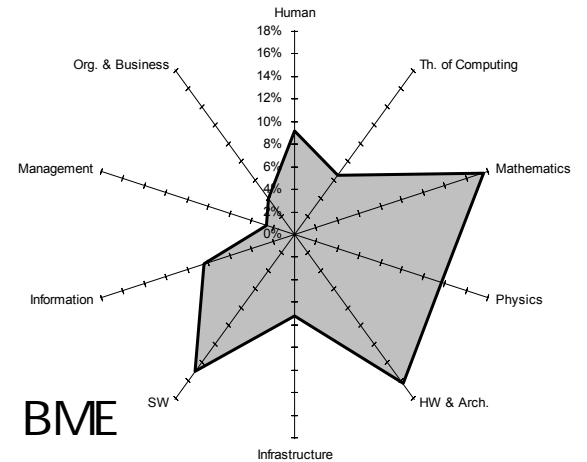
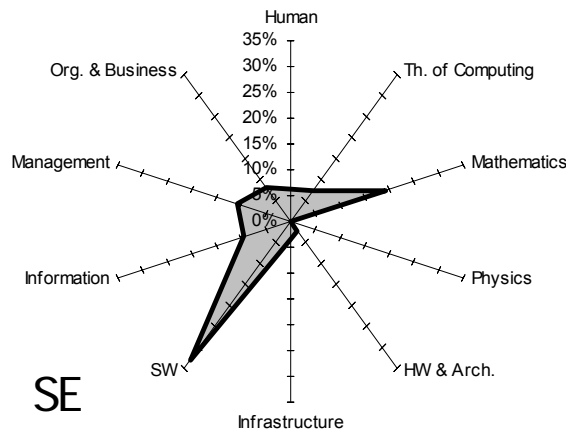
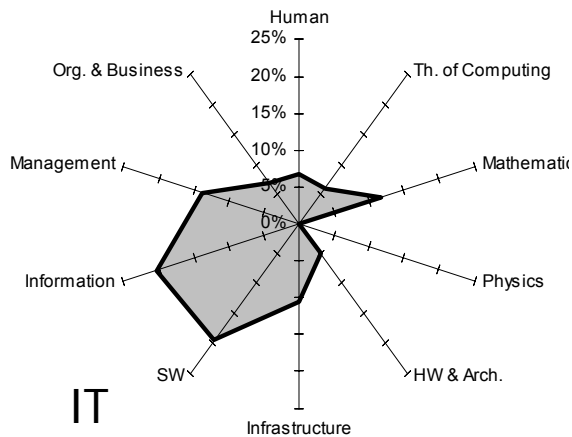
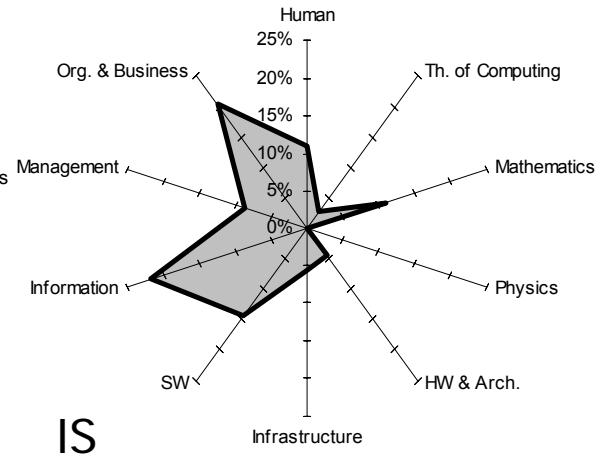
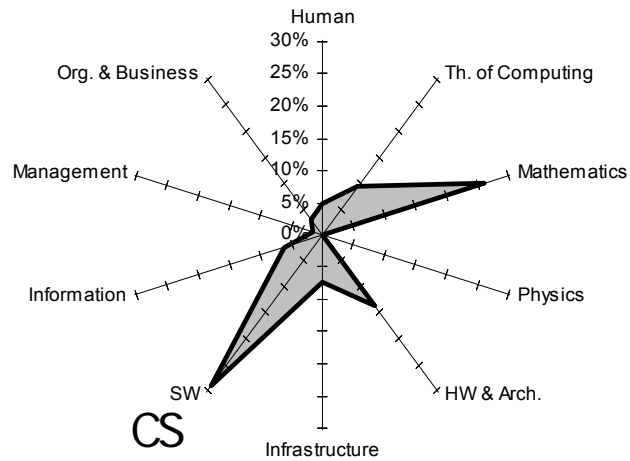
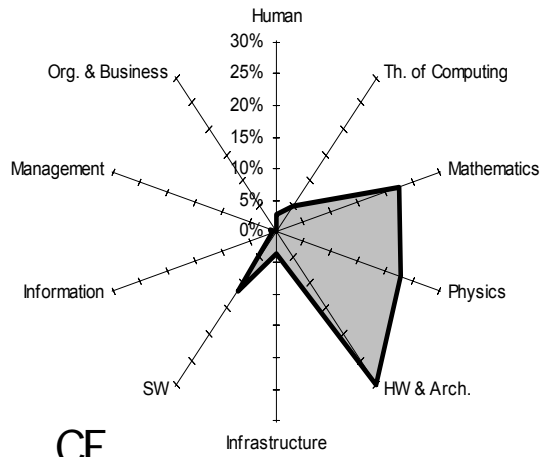
- **Defining the space of Informatics:**
 - ◆ Human
 - ◆ Theory of computing (including special mathematics)
 - ◆ Mathematics (except for computing-related, like Algorithms, etc.)
 - ◆ Physics (including system theory and electronics)
 - ◆ Hardware & Architecture (deep in HW and networking)
 - ◆ Infrastructure (fundamental HW-SW components and systems)
 - ◆ Software (including programming and SE)
 - ◆ Information (eg. databases)
 - ◆ Management (related to the information system)
 - ◆ Organization & Business
- **Classifying the topics** assigned as body of knowledge into the categories above, and doing the same with BME-VIK program

Tabular representation of the results

<i>Area</i>	<i>CE</i>		<i>CS</i>		<i>IS</i>		<i>IT</i>		<i>SE</i>		<i>BME-VIK</i>	
Human	16	3%	16	5%	20	11%	23	7%	35	6%	14	9%
Th. of Computing	30	5%	31	9%	5	3%	20	6%	40	7%	10	6%
Mathematics	132	23%	86	26%	20	11%	40	12%	110	20%	27	18%
Physics	133	23%		0%		0%		0%		0%	21	14%
HW & Arch.	174	30%	45	14%	8	4%	17	5%	12	2%	25	16%
Infrastructure	21	4%	24	7%	10	5%	36	11%	20	4%	11	7%
SW	68	12%	96	29%	26	14%	66	19%	187	33%	23	15%
Information	5	1%	20	6%	40	22%	69	20%	53	9%	13	8%
Management	6	1%	5	2%	16	9%	47	14%	62	11%	4	3%
Org. & Business		0%	10	3%	37	20%	23	7%	45	8%	6	4%
	585	1	333	1	182	1	341	1	564	1	154	1

- Units are ~ hours/week projected to one semester
- Non-uniform measures – only for relative weighting within a discipline
- Classifying is based on the consensus of some BME staff-members only

Graphical representation



Proposed improvements



What euroTICS could add to CC 2005 methods

- ◆ Elaborate a widely consensual definition of the space of Informatics
- ◆ Elaborate metrics for the weight of topics – CREDIT system???
- ◆ (Learning outcomes – it was an other presentation)



Thanks for your attention