

TOMÁŠ PITNER
CYBERSECURITY
QUALIFICATIONS

IT FOR PRACTICE 2018

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CYBERSECURITY QUALIFICATIONS

IMPORTANCE, ACHIEVEMENT SO FAR, WHAT'S TO BE DONE

Vision: A digital economy enabled by a knowledgeable and skilled cybersecurity workforce.

Mission: To energize and promote a robust network and an ecosystem of cybersecurity education, training, and workforce development.

[National Initiative for Cybersecurity Education (NICE)]

CYBERSECURITY DEFINITION

JTF DEFINES CYBERSECURITY AS:

*“computing-based discipline involving technology, people, information, and processes to enable assured operations. It involves the **creation, operation, analysis, and testing** of secure computer systems.*

*It is an **interdisciplinary course of study, including aspects of law, policy, human factors, ethics, and risk management** in the context of adversaries.”*

PEOPLE

SERIOUS LACK OF WORKFORCE THAT MAY WORSEN

- *"Demand for skilled workers with digital skills **increases by approximately 4% each** year. Unless decisive action is taken, the shortage of ICT professionals in the EU could worsen to **825,000 vacant posts** by 2020. "(EC Communication: 2015 Single European Digital Market Strategy)*
- *"Effective cyber-security is based largely on the skills of the relevant staff. However, **350,000 cyber security experts** are missing in Europe in the private sector by 2022. "(EC Communication: Resilience, Denial and Defense ... 450/2017)*

HOW TO COPE WITH THE LACK?

- Identify where and what is missing
 - Where - Critical sectors & infrastructures, key businesses
 - What - Need for a taxonomy & framework
- Urgent priorities
- How to help

E-CF 3.0

EUROPEAN E-COMPETENCE FRAMEWORK

European e-Competence Framework 3.0 overview

Dimension 1 5 e-CF areas (A – E)	Dimension 2 40 e-Competences identified	Dimension 3 e-Competence proficiency levels e-1 to e-5, related to EQF levels 3–8				
		e-1	e-2	e-3	e-4	e-5
A. PLAN	A.1. IS and Business Strategy Alignment					
	A.2. Service Level Management					
	A.3. Business Plan Development					
	A.4. Product/Service Planning					
	A.5. Architecture Design					
	A.6. Application Design					
	A.7. Technology Trend Monitoring					
	A.8. Sustainable Development					
	A.9. Innovating					
B. BUILD	B.1. Application Development					
	B.2. Component Integration					
	B.3. Testing					
	B.4. Solution Deployment					
	B.5. Documentation Production					
	B.6. Systems Engineering					
C. RUN	C.1. User Support					

EQF TO E-CF MAPPING

EUROPEAN QUALIFICATION FRAMEWORK

Annex 2: European e-CF and EQF level table

Beside of concepts explicitly elaborated for the European e-Competence Framework, the table contains description elements of 1) The European Qualifications Framework for Lifelong Learning (EQF), April 2008 and 2) The PROCOM Framework, of which generic job titles have been reproduced by kind permission of e-Skills UK.

EQF levels	EQF Levels descriptions	e-CF Levels	e-CF Levels descriptions	Typical Tasks	Complexity	Autonomy	Behaviour
8	Knowledge at the most advanced frontier, the most advanced and specialised skills and techniques to solve critical problems in research and/or innovation, demonstrating substantial authority, innovation, autonomy, scholarly or professional integrity.	e-5	Principal Overall accountability and responsibility; recognised inside and outside the organisation for innovative solutions and for shaping the future using outstanding leading edge thinking and knowledge.	IS strategy or programme management	Unpredictable – unstructured	Demonstrates substantial leadership and independence in contexts which are novel requiring the solving of issues that involve many interacting factors.	Conceiving, transforming, innovating, finding creative solutions by application of a wide range of technical and/or management principles.
7	Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking, critical awareness of knowledge issues in a field and at the interface between different fields, specialised problem-solving skills in research and/or innovation to develop new knowledge and procedures and to integrate knowledge from different fields, managing and transforming work or study contexts that are complex, unpredictable and require new strategic approaches, taking responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams.	e-4	Lead Professional / Senior Manager Extensive scope of responsibilities deploying specialised integration capability in complex environments; full responsibility for strategic development of staff working in unfamiliar and unpredictable situations.	IS strategy/ holistic solutions		Demonstrates leadership and innovation in unfamiliar, complex and unpredictable environments. Addresses issues involving many interacting factors.	
6	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles, advanced skills, demonstrating mastery and innovation in solving complex and unpredictable problems in a specialised field of work or study, management of complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts, for continuing personal and group professional development.	e-3	Senior Professional / Manager Respected for innovative methods and use of initiative in specific technical or business areas; providing leadership and taking responsibility for team performances and development in unpredictable environments.	Consulting	Structured – unpredictable	Works independently to resolve interactive problems and addresses complex issues. Has a positive effect on team performance.	Planning, making decisions, supervising, building teams, forming people, reviewing performances, finding creative solutions by application of specific technical or business knowledge/skills.
5	Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge, expertise in a comprehensive range of cognitive and practical skills in developing creative solutions to abstract problems, management and supervision in contexts where there is unpredictable change, reviewing and developing performance of self and others.	e-2	Professional Operates with capability and independence in specified boundaries and may supervise others in this environment; conceptual and abstract model building using creative thinking; uses theoretical knowledge and practical skills to solve complex problems within a predictable and	Concepts/ Basic principles		Works under general guidance in an environment where unpredictable change occurs.	Designing, managing, surveying, monitoring, evaluating, improving, finding non standard solutions.
4	Factual and theoretical knowledge in broad contexts within a field of work or study, expertise in a range of cognitive and practical skills in generating solutions to specific problems in a field of work or study, self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change, supervising the routine work of others, taking some responsibility for the evaluation					Independently resolves interactive issues which arise from project	Scheduling, organising, integrating, finding standard solutions, interacting, communicating

NICE FRAMEWORK (US)

MULTIPARTY EFFORT TO DEFINE CYBERSEC CURRICULLUM



ACM CSEC

MULTIPARTY EFFORT TO DEFINE CYBERSEC CURRICULLUM

- Association for Computing Machinery (ACM)
- IEEE Computer Society (IEEE CS)
- Association for Information Systems Special Interest Group on Security (AIS SIGSEC)
- International Federation for Information Processing Technical Committee on Information Security Education (IFIP WG 11.8)

ACM CSEC

MULTIPARTY EFFORT TO DEFINE CYBERSEC CURRICULLUM

- **Cybersecurity Curricula 2017**
- *Curriculum Guidelines for Post-Secondary Degree Programs in Cybersecurity*

"In fact, both government and non- government sources project nearly **1.8 million** cybersecurity-related positions going unfilled by 2022¹. The workforce demand is acute, immediate, and growing². In order to develop the required talent, academic departments across the spectrum of computing disciplines are launching initiatives to establish new cybersecurity programs or courses of study within existing programs. Whether developing full new programs, defining new concentrations within existing programs, or augmenting existing course content, these institutions need curricular guidance based on a comprehensive view of the cybersecurity field, the specific demands of the base discipline, and the relationship between the curriculum and cybersecurity workforce frameworks."

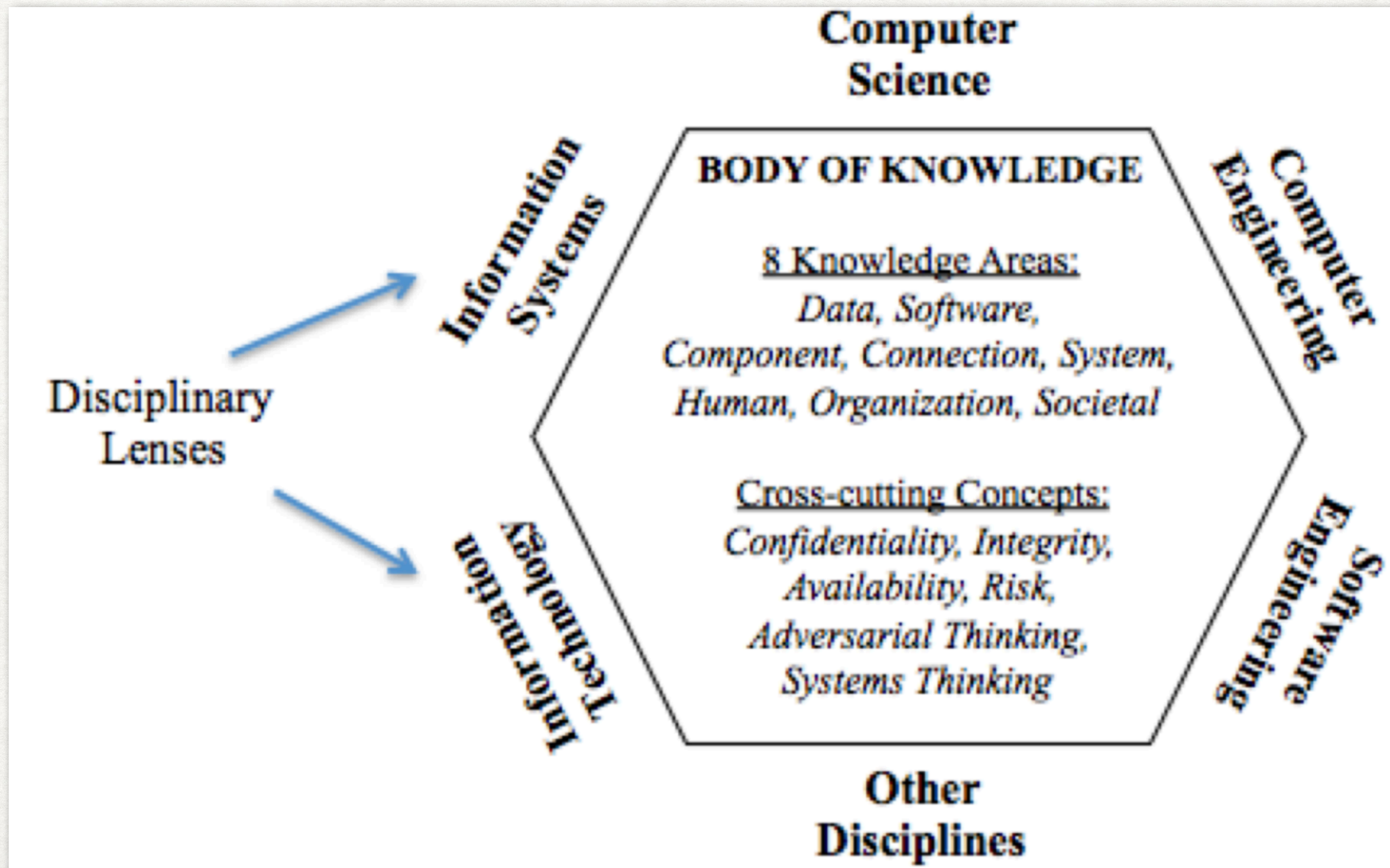
ACM CSEC

CYBERSECURITY CURRICULA 2017

- Faculty members in **computing-based** disciplines at **academic** institutions
- **Industry** members who will assist with cybersecurity program development
- **Training and professional** development providers
- Faculty members in **non-computing** based disciplines
- Academic **administrators** with oversight for program development
- **Workforce** framework developers (government and non-government)
- **Policymakers**
- Members of the **K-12 educational** community

ACM CSEC

CYBERSECURITY CURRICULA 2017



NATIONAL QUALIFICATION FRAMEWORK

GENERAL ALL-CATCH FRAMEWORK FOR CZECHIA

- **"Národní rámec kvalifikací"**
- Very sparse in terms of ICT
- Cybersecurity intermixed within ICT professions
- Applicable rather for secondary or upper-secondary education than a university
- But a **reference framework & starting point!**

NEED FOR NATIONAL QUALIFICATION FRAMEWORK IN CYBERSECURITY

SEVERAL EFFORTS BUT NONE WITH SIGNIFICANT IMPACT

- Collaboration of responsible bodies required
 - NÚKIB - National Cybersecurity Agency
 - Ministries of Defense, Interior, Police
 - Critical infrastructure operators
- Strong academic coordination
 - Interdisciplinary nature - IT, law, sociology/politology
 - Bound to new accreditation system - self-governed "institutional" or national one