

LA ENSEÑANZA DE LA INFORMÁTICA EN EUROPA: LAS COMPETENCIAS COMUNES DE LOS TÍTULOS DE INFORMÁTICA

EDUARDO VENDRELL

VICERRECTOR DE ESTUDIOS, CALIDAD Y ACREDITACIÓN. UPV

EQANIE PAST-PRESIDENT

INFORMÁTICA PARA TODOS: ¿REALIDAD O UTOPIA? - CURSOS DE VERANO 2018. UCLM

- ▶ **COMPETENCIAS?**
- ▶ **MARCOS DE REFERENCIA**
 - **ABET CS, SEOUL ACCORD, CC**
 - **E-CF**
 - **ICT BODY OF KNOWLEDGE**
 - **EURO-INF**
- ▶ **CONCLUSIONES**



COMPETENCIAS

COMPETENCIAS

**CONOCIMIENTOS
+
HABILIDADES
+
ACTITUDES**

**RESULTADOS DE
APRENDIZAJE**

**ACTIVIDADES
DOCENTES**

**ACTIVIDADES
DE EVALUACIÓN**

COMPETENCIAS

```
graph LR; A[COMPETENCIAS] --> B[COMPETENCIAS ESPECÍFICAS]; A --> C[COMPETENCIAS TRANSVERSALES];
```

COMPETENCIAS ESPECÍFICAS

COMPETENCIAS TRANSVERSALES

COMPETENCIAS

COMPETENCIAS BÁSICAS O GENERALES

COMPETENCIAS ESPECÍFICAS

COMPETENCIAS TRANSVERSALES

COMPETENCIAS? QUÉ COMPETENCIAS?



AS YOU CAN SEE, I'VE
MEMORIZED THIS UTTERLY
USELESS FACT LONG ENOUGH
TO PASS A TEST QUESTION.
I NOW INTEND TO FORGET
IT FOREVER. YOU'VE TAUGHT
ME NOTHING EXCEPT HOW
TO CYNICALLY MANIPULATE
THE SYSTEM. CONGRATULATIONS.





MARCOS DE REFERENCIA

ESTÁNDARES O MARCOS DE REFERENCIA

- ▶ Proporcionan perfiles claramente definidos: académicos, profesionales, orientados a la investigación...
- ▶ Están basados en competencias
- ▶ Ayudan a definir el plan de estudios y su organización
- ▶ Normalmente están definidos a partir de diferentes niveles académicos (grado, master, doctorado) y/o perfiles profesionales (ingeniería, ciencia, leyes, medicina...).

SELLOS DE CALIDAD

- ▶ Proporcionan transparencia a las instituciones de educación superior y a sus titulaciones
- ▶ Proporcionan un marco de referencia basado en competencias
- ▶ Certifican titulaciones a través de un conjunto de estándares ligados a la calidad de la docencia, los recursos y la gestión
- ▶ Aseguran que los estudiantes cumplen con determinados requisitos

GARANTÍA DE CALIDAD

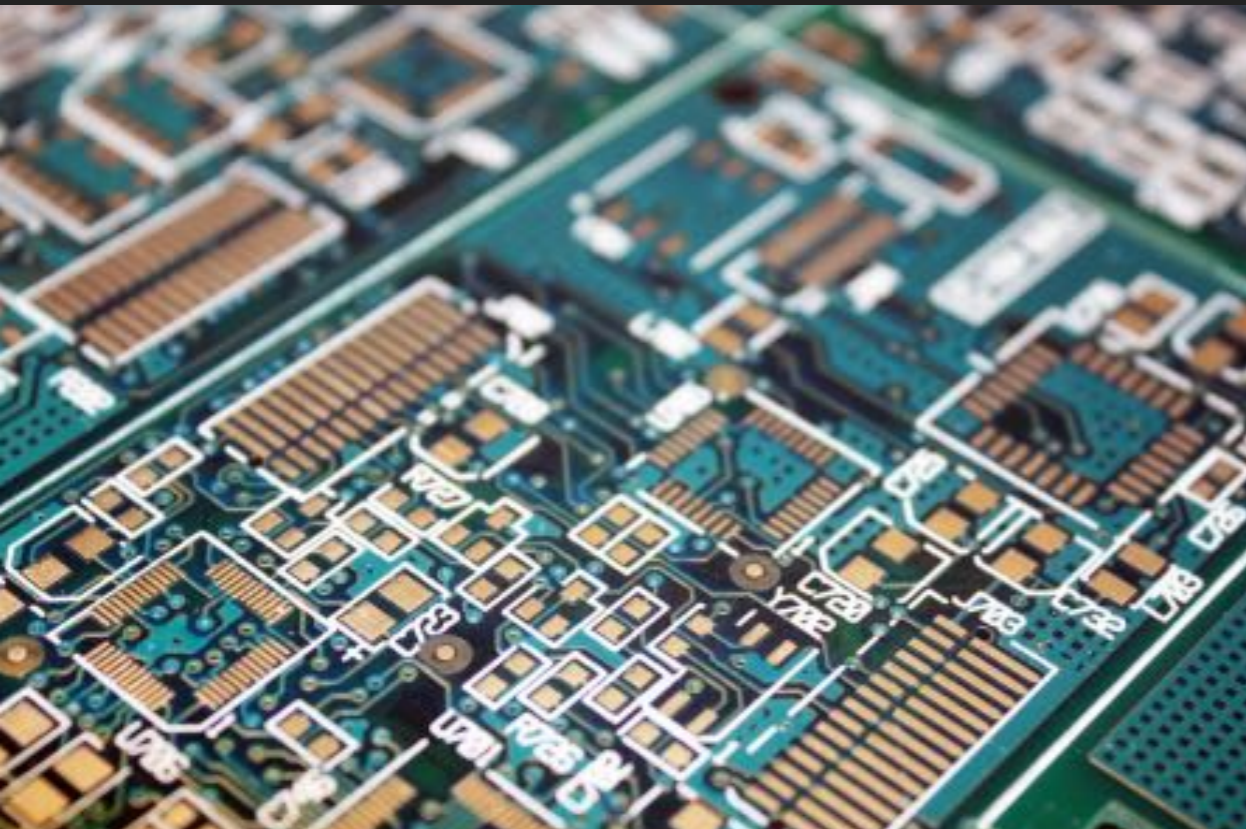


- ▶ La **acreditación** asegura que los títulos están organizados de acuerdo a unos principios básicos
- ▶ Los **marcos de referencia** proporcionan perfiles de referencia transparentes para el desarrollo de los planes de estudios y ayudan a recibir reconocimientos de calidad
- ▶ Los **sellos de calidad** ayudan a certificar la calidad de los títulos y de las instituciones de educación superior

GARANTÍA DE CALIDAD: BUENAS PRÁCTICAS



LAS DIFERENTES CARAS DE LA INFORMÁTICA



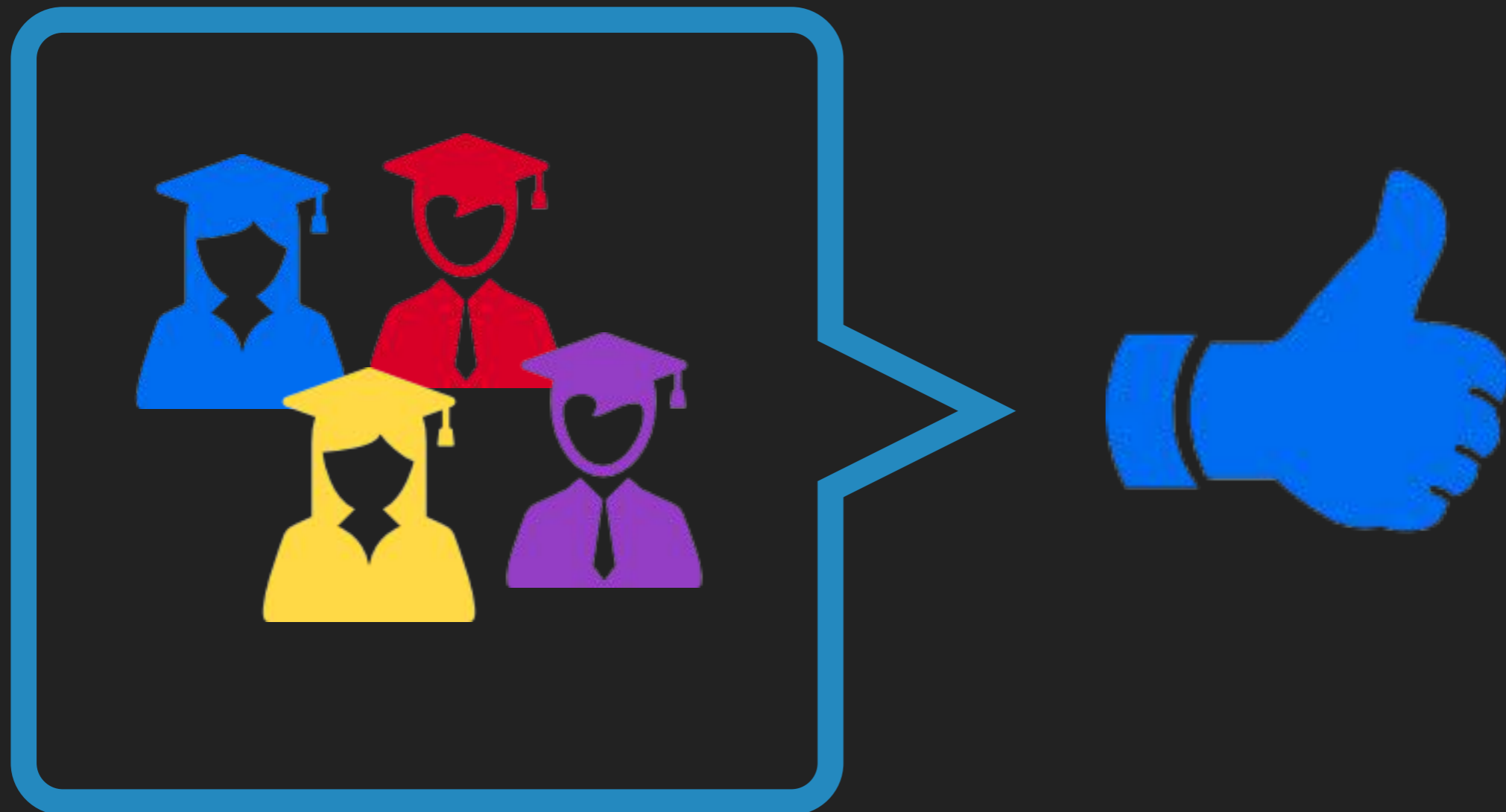
LAS DIFERENTES CARAS DE LA INFORMÁTICA

- ▶ La Informática es una disciplina relativamente joven que está en constante definición
- ▶ Hay diferentes aproximaciones académicas a esta disciplina, que a su vez llevan a diferentes perfiles profesionales
- ▶ La Informática es transversal y está en continuo crecimiento en diferentes contextos (salud, entretenimiento, industria...)
- ▶ Aparece con diferentes denominaciones (informática, computación, computer science, IT, TIC...)

LAS DIFERENTES CARAS DE LA INFORMÁTICA



LAS DIFERENTES CARAS DE LA INFORMÁTICA: NECESIDAD DE GARANTÍA DE CALIDAD



WASHINGTON ACCORD



- ▶ *Acuerdo internacional entre entidades responsables de acreditar programas académicos de ingeniería.*
- ▶ *Reconoce una equivalencia sustancial entre programas acreditados por agencias de acreditación miembros y recomienda el que los graduados en programas acreditados por estas agencias sean reconocidos por otras agencias, en el entendido de que cumplen con los requisitos necesarios para la práctica de la ingeniería*

- ▶ Acreditación de programas de **ingeniería**
- ▶ **Reconocimiento mutuo**

SEOUL ACCORD



- ▶ *Acuerdo multilateral entre agencias responsables de acreditar o reconocer programas de educación terciaria en el ámbito de la informática ("computing and IT")*
- ▶ *Reconocimiento de equivalencia de programas académicos acreditados en Informática ("computing or IT")*

- ▶ Acreditación de programas de **informática**
- ▶ **Reconocimiento mutuo**

SEOUL ACCORD



- ▶ *Se definen atributos de cara a establecer el alcance y los estándares de un programa de estudios reconocido por el Seoul Accord.*
- ▶ *No se espera que los programas tengan las mismas competencias, más bien se espera que generen graduados preparados para ejercer una carrera profesional en el ámbito de la informática.*
- ▶ *Los atributos definidos para los graduados en un programa son un punto de referencia para que las agencias de acreditación puedan comparar y asumir las competencias que pueden ser sustancialmente equivalentes.*

SEOUL ACCORD



	GRADUATE ATTRIBUTES	Differentiating Characteristic	... for Seoul Accord (Computing Professional) Graduate	... for Computing Technologist Graduate	... for Computing Technician Graduate
1	Academic Education	Educational depth and breadth	Completion of an accredited program of study designed to prepare graduates as computing professionals	Completion of a program of study typically of shorter duration than for professional preparation	Completion of a program of study typically of shorter duration than for technologist preparation
2	Knowledge for Solving Computing Problems	Breadth and depth of education and type of knowledge, both theoretical and practical	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and
3	Problem Analysis	Complexity of analysis	Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences,	Identify, formulate, research literature, and solve broadly-defined computing problems reaching substantiated	Identify and solve well-defined computing problems reaching substantiated conclusions using codified methods of analysis
4	Design/ Development of Solutions	Breadth and uniqueness of computing problems, i.e., the extent to which problems are original and to which solutions have previously been identified or codified	Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for	Design solutions for broadly-defined computing technology problems, and contribute to the design of systems, components,	Design solutions for well-defined computing problems, and assist with the design of systems, components, or processes to
5	Modern Tool Usage	Level and appropriateness of the tool to the type of activities performed	Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations	Select and apply appropriate techniques, resources, and modern computing tools to broadly-defined computing	Apply appropriate techniques, resources, and modern computing tools to well-defined computing activities, with an
6	Individual and Team Work	Role in, and diversity of, the team	Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings	Function effectively as an individual and as a member or leader in diverse technical teams	Function effectively as an individual and as a member in diverse technical teams
7	Communication	Level of communication according to type of activities performed	Communicate effectively with the computing community and with society at large about complex computing activities by being able to comprehend and write effective reports, design	Communicate effectively with the computing community and with society at large about broadly-defined computing activities by	Communicate effectively with the computing community and with society at large about well-defined computing activities by
8	Computing Professionalism and Society	No differentiation in this characteristic except level of practice	Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice	Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential	Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential
9	Ethics	No differentiation in this characteristic except level of practice	Understand and commit to professional ethics, responsibilities, and norms of professional computing practice	Understand and commit to professional ethics, responsibilities, and norms of computing technologist practice	Understand and commit to professional ethics, responsibilities, and norms of computing technician practice
10	Life-long Learning	No differentiation in this characteristic except level of practice	Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional	Recognize the need, and have the ability, to engage in independent learning for continual development as a	Recognize the need, and have the ability, to engage in independent learning for continual development as a

ABET



- ▶ *Agencia de acreditación para programas académicos en el ámbito de las ciencias aplicadas, la informática (computing), la ingeniería y la tecnología para la ingeniería (engineering technology)*
- ▶ *Asegura el que una institución de educación superior cumple con los estándares de calidad de la profesión para la que prepara un programa de estudios*

▶ Acreditación de programas (ingeniería, informática...)



Computing Accreditation Commission
Version 2.0

CRITERIA FOR ACCREDITING COMPUTING PROGRAMS

Optional for Reviews During the 2018-2019 Accreditation Cycle
Mandatory for Reviews During the 2019-2020 Accreditation Cycle
Incorporates all changes approved by the ABET Board of Delegates
Computing Area Delegation as of October 20, 2017

ABET
415 N. Charles Street
Baltimore, MD 21201
Telephone: 410-347-7700
Fax: 443-552-3644
E-mail: accreditation@abet.org
Website: www.abet.org

C001 10/20/2017

Optional 2018-2019 Criteria Version 2.0 for Accrediting Computing Programs

I. GENERAL CRITERIA

Criterion 1. Students

Student performance must be evaluated. Student progress must be monitored to foster success in attaining student outcomes, thereby enabling graduates to attain program educational objectives. Students must be advised regarding curriculum and career matters.

The program must have and enforce policies for accepting both new and transfer students, awarding appropriate academic credit for courses taken at other institutions, and awarding appropriate academic credit for work in lieu of courses taken at the institution. The program must have and enforce procedures to ensure and document that students who graduate meet all graduation requirements.

Criterion 2. Program Educational Objectives

The program must have published program educational objectives that are consistent with the mission of the institution, the needs of the program's various constituencies, and these criteria. There must be a documented, systematically utilized, and effective process, involving program constituencies, for the periodic review of these program educational objectives that ensures they remain consistent with the institutional mission, the program's constituents' needs, and these criteria.

Criterion 3. Student Outcomes

The program must have documented and publicly stated student outcomes that include (1) through (5) below and any outcomes required by applicable Program Criteria. The program may define additional outcomes.

Graduates of the program will have an ability to:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

Criterion 4. Continuous Improvement

The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. The results of these evaluations must be systematically utilized as input for the continuous improvement of the program. Other available information may also be used to assist in the continuous improvement of the program.

MARCOS DE REFERENCIA: CONTEXTO INTERNACIONAL

ABET



		STUDENT OUTCOMES
COMUNES	1	Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
	2	Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
	3	Communicate effectively in a variety of professional contexts.
	4	Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
	5	Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
CS		Apply computer science theory and software development fundamentals to produce computing-based solutions.
IS		Support the delivery, use, and management of information systems within an information systems environment.
IT		Identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing- based systems.stems. [IT]
Cybersecurity		An ability to apply security principles and practices to the environment, hardware, software, and human aspects of a system.
		An ability to analyze and evaluate systems with respect to maintaining operations in the presence of risks and threats.

COMPUTING CURRICULA

- ▶ *Estándar de referencia para el diseño curricular de planes de estudios en el ámbito de la informática ('computing').*
- ▶ *Iniciativa en EE.UU. de ACM, IEEE y AIS. Primera versión en 2001.*
- ▶ *Cubre los campos de 'computer science', 'computer engineering', 'information systems', 'information technology' y 'software engineering'.*
- ▶ *Hace referencia a áreas de conocimiento, con ejemplos de asignaturas y recomendaciones para establecer resultados de aprendizaje.*
- ▶ *Es un marco de referencia académico.*

COMPUTING CURRICULA

Computing Curricula 2005

The Overview Report

covering undergraduate degree programs in

Computer Engineering
Computer Science
Information Systems
Information Technology
Software Engineering

A volume of the *Computing Curricula Series*

The Joint Task Force for Computing Curricula 2005

A cooperative project of
The Association for Computing Machinery (ACM)
The Association for Information Systems (AIS)
The Computer Society (IEEE-CS)

30 September 2005

Computer Engineering Curricula 2016

CE2016

Curriculum Guidelines for Undergraduate Degree Programs



Software Engineering 2014

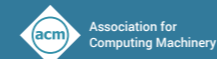
Curriculum Guidelines for Undergraduate Degree Programs in Software Engineering

A Volume of the Computing Curricula Series

CYBERSECURITY CURRICULA 2017

Curriculum Guidelines for Post-Secondary Degree Programs in Cybersecurity

A Report in the Computing Curricula Series
Joint Task Force on Cybersecurity Education



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

Version 1.0 Report
31 December 2017

IS 2010

Curriculum Guidelines for Undergraduate Degree Programs in Information Systems

Association for Computing Machinery (ACM)
Association for Information Systems (AIS)

Computer Science Curricula 2013

Curriculum Guidelines for Undergraduate Degree Programs in Computer Science

December 20, 2013

Information Technology Curricula 2017

IT2017

Curriculum Guidelines for Baccalaureate Degree Programs in Information Technology

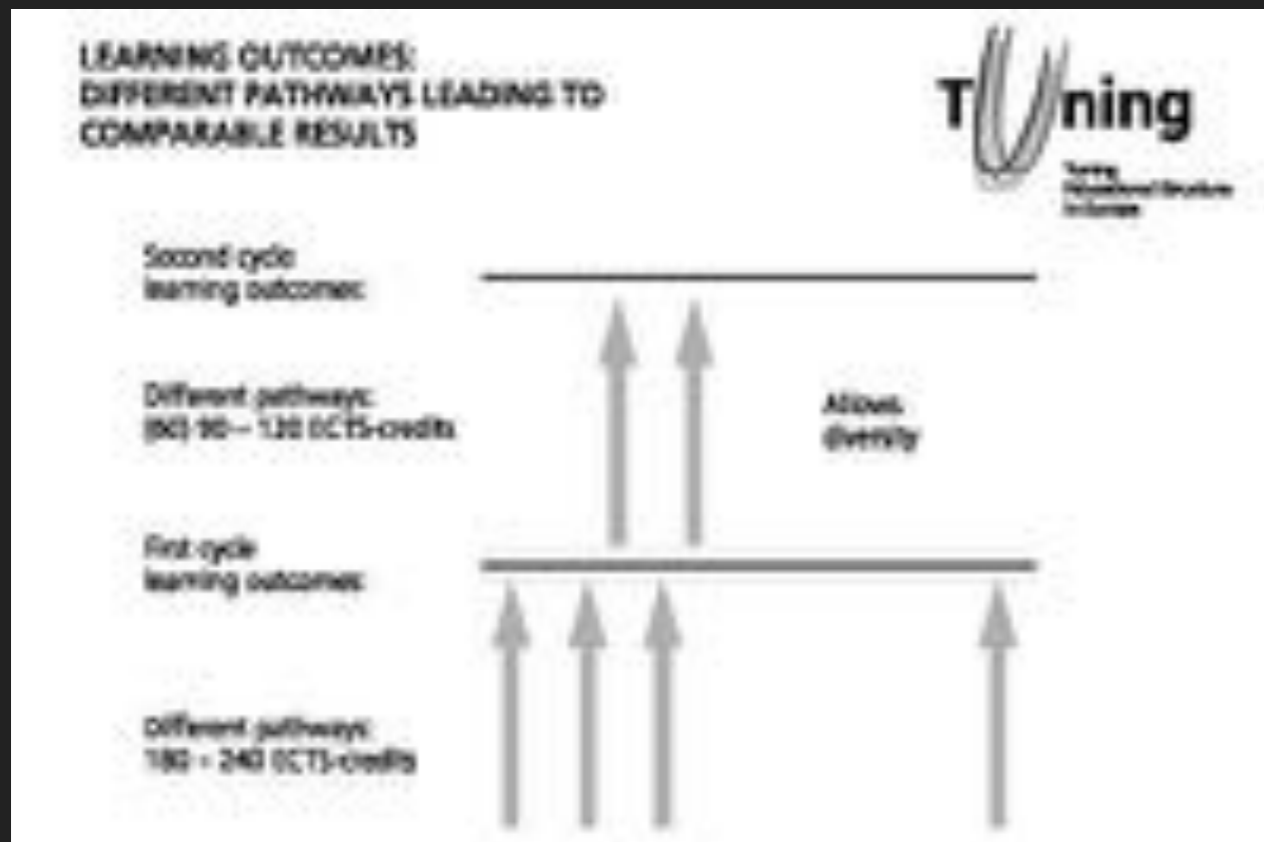
A Report in the Computing Curricula Series
Task Group on Information Technology Curricula

Association for Computing Machinery (ACM)
IEEE Computer Society (IEEE-CS)

2017 December 10



EL PROYECTO TUNING



- ▶ *Comienza en el año 2000 como un proyecto para enlazar los objetivos políticos del proceso de Bolonia con el sector educativo de nivel superior.*
- ▶ *Es una aproximación para (re)diseñar, desarrollar, evaluar y mejorar la calidad de los programas de primer, segundo y tercer ciclo.*
- ▶ *El proyecto Tuning pone el foco en el contenido de los estudios, es decir, en el área temática de los programas.*

LA INICIATIVA E-SKILLS



- ▶ Promoción de las habilidades digitales y la alfabetización digital en Europa.
- ▶ Políticas de monitorización y benchmarking.
- ▶ Acciones:
 - **e-Competence Framework**
 - **e-Leadership**
 - **the ICT Professionalism framework**
 - e-Skills for Jobs
 - Grand Coalition for Digital Jobs

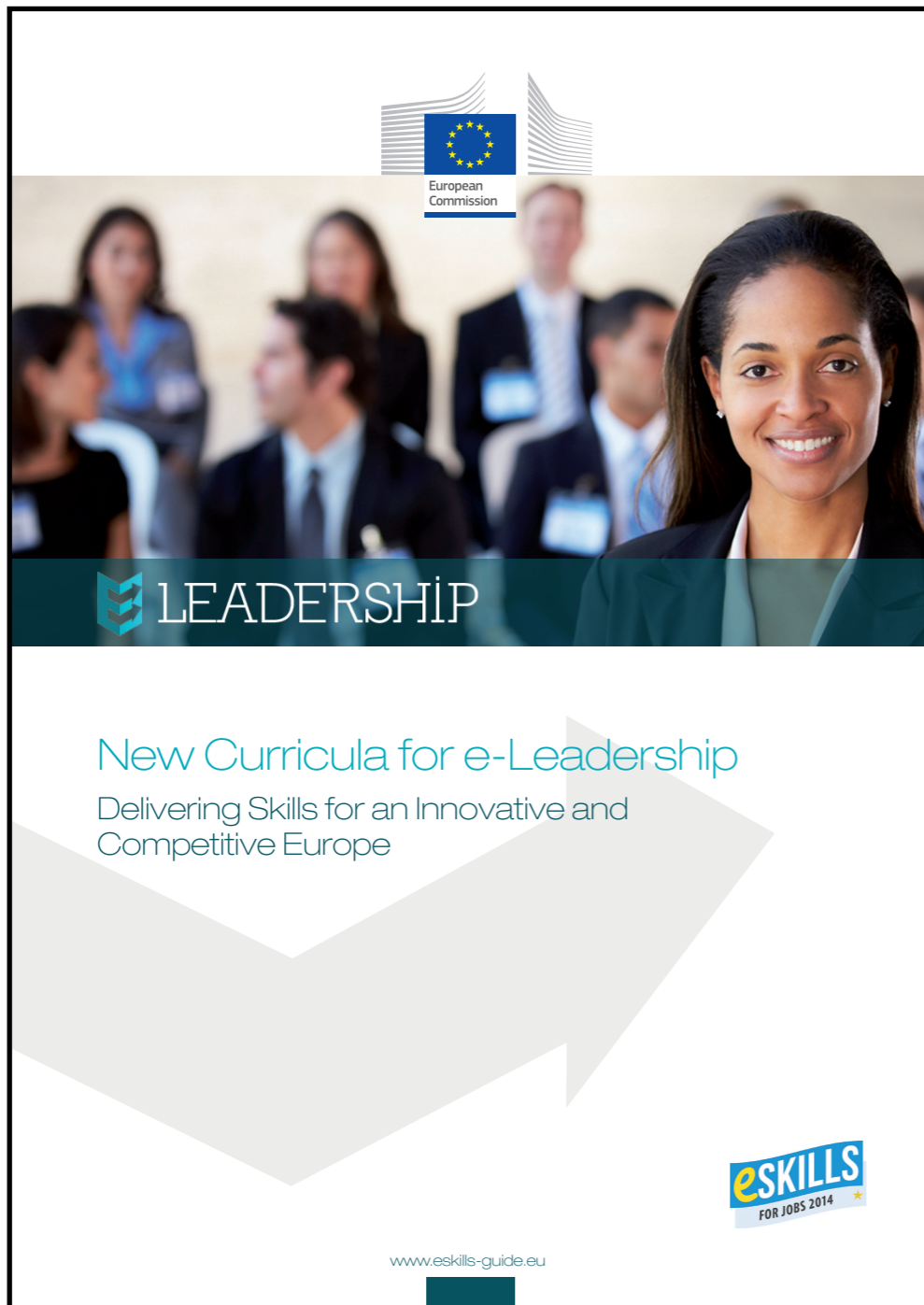
EL E-COMPETENCE FRAMEWORK (E-CF)

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					
	C.2. Change Support					
	C.3. Service Delivery					
	C.4. Problem Management					
D. ENABLE	D.1. Information Security Strategy Development					
	D.2. ICT Quality Strategy Development					
	D.3. Education and Training Provision					
	D.4. Purchasing					
	D.5. Sales Proposal Development					
	D.6. Channel Management					
	D.7. Sales Management					
	D.8. Contract Management					
	D.9. Personnel Development					
	D.10. Information and Knowledge Management					
	D.11. Needs Identification					
	D.12. Digital Marketing					
E. MANAGE	E.1. Forecast Development					
	E.2. Project and Portfolio Management					
	E.3. Risk Management					
	E.4. Relationship Management					
	E.5. Process Improvement					
	E.6. ICT Quality Management					
	E.7. Business Change Management					
	E.8. Information Security Management					
	E.9. IS Governance					

- ▶ Una iniciativa de la Comisión Europea
- ▶ El e-Competence Framework (e-CF) proporciona una referencia de 40 competencias que se necesitan y aplican en el ámbito profesional de las TIC, a partir de un lenguaje común para competencias, habilidades y niveles de desempeño.
- ▶ <http://www.ecompetences.eu>

LA INICIATIVA E-LEADERSHIP



- ▶ Una iniciativa de la Comisión Europea
- ▶ Liderazgo entendido en el ámbito de las TIC, con objetivos que involucran a las TIC, en contextos donde las TIC suponen un motor de innovación y aportan valor a las organizaciones.
- ▶ Identifica diferentes perfiles curriculares.
- ▶ <http://eskills-lead.eu>

LA INICIATIVA E-LEADERSHIP

NEW CURRICULA FOR E-LEADERSHIP SKILLS

GUIDELINES AND QUALITY LABELS FOR NEW
CURRICULA FOR E-LEADERSHIP SKILLS IN EUROPE



March 2015



Content

2	Introduction and Overview	4
2.1	Background and Objectives	4
2.2	Guidelines and Quality Label – An Overview	4
3	The European Guidelines for New Curricula for e-Leadership Skills in Europe	6
3.1	Introduction	6
3.2	Scoping the guidelines	6
3.3	Requirements for curriculum profile design	7
3.4	The structure of a curriculum profile	8
3.5	Guidelines for constructing curriculum profiles	8
3.6	Guidance for a portfolio of curriculum profiles	9
3.7	Presenting conformant programmes	10
4	Quality labelling for e-leadership programmes	11
4.1	Introduction	11
4.2	The quality claim	11
4.3	Building on curriculum profiles	12
4.4	Continuous improvement at two levels	13
4.5	Quality principles	13
4.6	A set of quality criteria for the quality label	14
4.7	Label award procedure	15
4.8	Efficient assessment	16
4.9	Governing quality label award	17
5	Gaining feedback from alumni e-leaders	18
5.1	Introduction and rationale	18
5.2	Guideline overview	18
5.3	Content Guidelines	18
5.3.1	Design Guidelines	20
5.4	Process Guidelines	20
5.5	Meta Guidelines	21
6	ANNEX 1: Background and Methodology of the Guidelines Development Process	22
6.1	Methodology	22
6.2	A concise view of the skill set	22
6.3	Profiles of ICT Professionals	23
6.4	Prior best practice	24
6.5	Capitalising on curriculum guidelines and development techniques	25
6.5.1	The ecosystem framework	29
6.6	Ensuring currency of content	30
7	ANNEX 2: Background and Methodology of the Quality Label Development Process	32

EL MARCO PROFESIONAL DE LAS TIC (ICT PROFESSIONALISM)

Digital Skills for Europe

Towards a European Framework for ICT Professionals

Shortages, gap and mismatches of e-Skills are negatively impacting the growth, competitiveness and drive for innovation in Europe.

With more governments recognizing the need to promote e-Skills, the European Commission and a consortium of partners set up a Framework to enhance ICT professionalism. Support the growth of digital skills in Europe by participating in the initiative.

► <http://ictprofessionalism.eu>

EL MARCO PROFESIONAL DE LAS TIC (ICT PROFESSIONALISM)



EL ICT BODY OF KNOWLEDGE

KNOWLEDGE AREAS	e-CF																																				
	IS and Business Strategy Alignment	Service Level Management	Business Plan Development	Product/ Service Planning	Architecture Design	Application Design	Technology Trend Monitoring	Sustainable Development	Innovating	Application Development	Component integration	Testing	Solution Deployment	System engineering	User support	Change support	Service Delivery	Problem Management	Information security strategy development	ICT quality strategy development	Channel Management	Sales Management	Contract Management	Personnel development	Information and knowledge management	Needs identification	Digital marketing	Project and Portfolio Management	Risk Management	Relationship Management	Process Improvement	ICT Quality Management	Business Change Management	Information Security Management	IS Governance		
ICT Strategy & Governance	X		X															X										X	X				X		X		
Business and Market of ICT			X			X	X														X	X				X	X							X			
Project Management				X														X									X										
Security Management										X				X		X	X		X																X		
Quality Management		X																		X											X	X					
Architecture	X				X	X				X				X																							
Data and Information Management						X				X				X	X										X												
Network and Systems Integration	X						X			X	X		X	X																							
Software Design and Development						X				X	X		X	X	X																						
Human Computer Interaction					X	X			X	X	X															X											
Testing											X	X	X																							X	
Operations and Service Management		X		X													X	X	X	X			X			X											
Soft Skills																								X					X								
IT Legal, Ethical, Social and Professional practices	X						X																X		X		X										
Disruptive Technologies	X					X	X																														

Match entre el c-CF y las áreas de conocimiento del ICT BoK

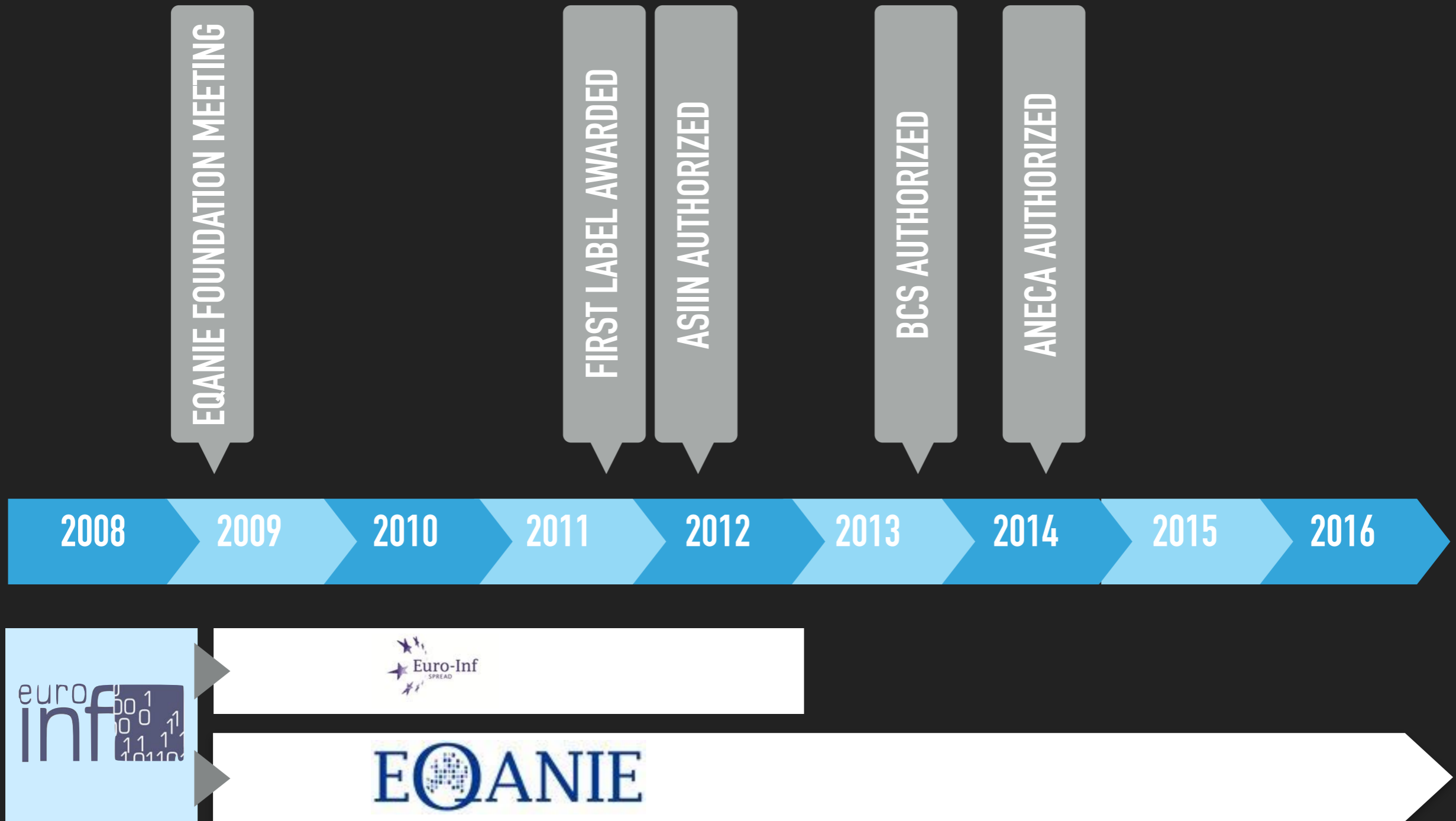
UN SELLO DE CALIDAD 'PARAGUAS' PARA LA INFORMÁTICA



UN SELLO DE CALIDAD 'PARAGUAS' PARA LA INFORMÁTICA

- ▶ Un Marco de referencia común con competencias básicas y transversales
- ▶ Una aproximación a un campo específico basada en competencias
- ▶ Tiene en cuenta la práctica profesional y aspectos éticos y legales
- ▶ Abierto a diferentes aproximaciones de la informática

EL PROYECTO EURO-INF Y EQANIE



EQANIE



- ▶ *La European Quality Assurance Network for Informatics Education promueve la evaluación de la calidad en sistemas de educación superior en informática en Europa y países de otros continentes.*
- ▶ *En particular, EQANIE ayuda a construir confianza en sistemas de acreditación de grados y másters en informática en Europa.*
- ▶ *Se asocia con universidades y asociaciones académicas y profesionales para evaluar la calidad de titulaciones en el ámbito de la informática.*

EL ESTÁNDAR EURO-INF



EURO-INF
FRAMEWORK STANDARDS
AND
ACCREDITATION CRITERIA
FOR
INFORMATICS DEGREE PROGRAMMES



Version: 2015-10-12

- ▶ ASOCIADO AL ÁMBITO DE LA INFORMÁTICA
- ▶ BASADO EN COMPETENCIAS
- ▶ PRIMER Y SEGUNDO CICLO

6 CATEGORÍAS:

- ▶ CONCEPTOS BÁSICOS DE LA INFORMÁTICA
- ▶ ANÁLISIS
- ▶ DISEÑO E IMPLEMENTACIÓN
- ▶ CONTEXTO ECONÓMICO, LEGAL, SOCIAL, ÉTICO Y MEDIOAMBIENTAL
- ▶ PRÁCTICA DE LA INFORMÁTICA
- ▶ OTRAS COMPETENCIAS PROFESIONALES



CONCLUSIONES

CONCLUSIONES

- ▶ Existen diferentes marcos de referencia internacionales en el ámbito de la informática, basados en **competencias**.
- ▶ Competencias? Contenidos!
- ▶ Problema al definir actividades docentes y de evaluación.
- ▶ Hay una iniciativa general en Europa que tiene como objetivo el desarrollo de las competencias digitales a diferentes niveles > e-CF, e-Leaderchip, ICT BoK
- ▶ EURO-INF

- ▶ De manera general, los marcos de referencia contemplan:
 - ▶ **Competencias específicas de la informática**
 - ▶ Conocimiento y comprensión
 - ▶ Analizar, crear y desarrollar
 - ▶ Aplicar y resolver
 - ▶ **Competencias transversales**
 - ▶ **Práctica y ética profesional**

- ▶ Hay a nivel internacional 3 marcos de referencia reconocidos para el ámbito de la informática:
 - ▶ **Seoul Accord**
 - ▶ **ABET Computing**
 - ▶ **Euro-Inf**
- ▶ Existen otros modelos de referencia académicos que se utilizan para diseño de titulaciones. El más evidente y más reconocido es el **Computing Curricula**

SEOUL ACCORD	ABET COMPUTING	EURO-INF
Academic Education	Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.	Conceptos básicos de la informática
Knowledge for Solving Computing Problems	Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.	Análisis
Problem Analysis	Communicate effectively in a variety of professional contexts.	Diseño e implementación
Design/ Development of Solutions	Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.	Contexto económico, legal, social, ético y medioambiental
Modern Tool Usage	Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.	Práctica de la informática
Individual and Team Work	Apply computer science theory and software development fundamentals to produce computing-based solutions [CS]	Otras competencias profesionales
Communication	Support the delivery, use, and management of information systems within an information systems environment. [IS]	 <ul style="list-style-type: none"> Específicas de la informática Practica y ética profesional Competencias transversales
Computing Professionalism and Society	Identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing- based systems. [IT]	
Ethics	An ability to apply security principles and practices to the environment, hardware, software, and human aspects of a system. [CY]	
Life-long Learning	An ability to analyze and evaluate systems with respect to maintaining operations in the presence of risks and threats. [CY]	

#GRACIAS