Towards a European Certification of Informatics Curricula

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Abstract

- The italian situation
- GRIN quality certification label (*Bollino GRIN*)
- A demo of the system
- Towards european coordination

The Italian situation (1)

- Implementation of “Bologna process”
  - From the single level degree system to the two levels one
- Autonomy of University in defining degree curricula
  - “Market” of educational offers
- All Computer Science/Engineering degrees are equal in front of the law
- Informatics is a scientific curriculum still attracting large number of students

The Italian situation (2)

- It is difficult to evaluate real quality of curricula from the outside
- How to guarantee both quality education within university flexibility
- "*Bollino GRIN*" (=GRIN quality certification label) was designed to deal with this situation
- First effort of this kind in Italy
- Do-it-yourself by our community
- Supported by Italian Council of University Deans (CRUI)

Organizational constraints/choices

- Only first level degree program (bachelor)
- Based on limited amount of data
- Data easy to get and to check
- Use data already being collected as part of the normal management effort of a degree program
- Use a committee with external experts to validate the process
- Define two certification levels to enable inter-disciplinary degree programs

Accreditation reqs in general

1. The percentage of informatics-related courses in the degree program has to be relevant
2. The main areas of Informatics should be properly covered
3. The degree program should not be overly focused on a single area
4. There should be enough informatics professors

Some context information

- Degree programs are specified in credits
- 1 credit corresponds to 25 “working” hours for the student (usually, 8-10 hours are lectures)
- For the first level degree (bachelor) 180 credits are required
- The normal duration is 3 years (i.e. 1500 learning hours per year)

Basic level accreditation reqs

1. At least 78 credits must be assigned to learning activities in Computer Science/Engineering.
2. At least 60 credits (out of the 78 above) must be assigned to learning activities in the 11 top-level areas
3. At least 7 top-level areas (out of the 11) must be covered by at least 6 credits.
4. At least 8 Computer Science/Engineering professors must be fully assigned to the degree program (for the first program, then 6)

- Advanced level has higher thresholds for the first three requirements

The 11 top level areas

A. Foundations
B. Algorithms
C. Programming
D. Computer Languages
E. Computer Architectures
F. Operating Systems
G. Data Base Management Systems
H. Network Computation
I. Software Engineering
L. Human Computer Interaction, Graphics, Multimedia
M. Knowledge Representation

Operating procedure

- A web site supports the process
- Credits of each mandatory course in the degree program are classified according to the 11 top-level areas
- Describe arguments covered during lecture hours corresponding to each single credit (Syllabi)
- First 3 requirements are automatically checked
- The president of degree program management board self-certifies the constraint regarding the number of professor
- The procedure is repeated each academic year

Results

- Effort ongoing since 2002-03
- The web site is publicly available at
  - **http://grin.informatica.uniroma2.it**
- 2004: 39 certified out of 57 (univ. 31/39)
- 2005: 42 certified out of 54 (univ. 35/42)
- 2006: 44 certified out of 54 (univ. 37/42)

- Each degree program pay an annual fee of 150 Euros

Correspondence between curricula

- The web site supports curricula recast when students transfer to a different university
- Based on sub-areas
  - A finer partition of each of the 11 top-level areas
  - “starred” sub-areas are “recommended” ones

A – Foundations

* ALF - Automi, Linguaggi Formali
* CAL - Calcolabilità
* COM - Complessità
* SLP - Semantica dei Linguaggi di Programmazione

TIC - Teoria dell'Informazione e Codici

L - Logica

SD - Sistemi Dinamici

V - Varie

B – Algorithms

* SDF - Strutture di Dati Fondamentali
* TAPA - Tecniche fondamentali di Analisi e Progetto di Algoritmi
* A - Algoritmi fondamentali
* ASC - Algoritmi su Strutture Combinatorie

TAA - Tecniche Algoritmiche Avanzate

SDA - Strutture di Dati Avanzate

AD - Algoritmi Distribuiti

AP - Algoritmi Paralleli

AN - Algoritmi Numerici

V - Varie

C – Programming

* PSA - Problem Solving e Algoritmi
* SS - Sintassi e Semantica
* CB - Costrutti di Base
* P - Procedure
* R - Ricorsione
* SDTD - Strutture Dati e Tipi di Dati astratti
* SCP - Sviluppo e Correttezza dei Programmi
* POO - Programmazione Orientata agli Oggetti

  PP - Paradigmi di Programmazione

  PCC - Programmazione Concorrente

  V - Varie

Correspondence between curricula

- Correspondence is based on the classification of single credit syllabi in terms of area and sub-area
- The set of syllabi is “Diploma Supplement ready”
- N.B. A same argument could be classified under two different sub-areas
  - Introduce a notion of “affinity” among sub-areas (tbd)

Demo of the system

What's missing in our process

- Indication on which / how-much mathematics has to be covered
  - National legislation prescribes at least 12 credits
  - Working on this issue this year (2006-07)
- Criteria regarding laboratory and other "hands on" activity
- Logistic requirements (e.g., PC/students, ...)
- Procedural requirements (e.g., how exams are organized, ...)
- Criteria regarding education on
  - System-oriented vision
  - Capability to understand "application areas" and "business needs"

Positive outcomes

- Strengthened the sense of community
  - ...same family
- Helped smaller groups to get more resources
- Helped newer degree program to start more focused

Towards european coordination

- A similar mechanism at the european level might be helpful
  - Strengthen the european Informatics sense of community
  - Help in building a shared vision: who are we, what we do, where we want to go
  - Support quality assurance for Informatics education in Europe while respecting autonomy and the need for flexibility
- May have practical use for students mobility:
  - Students moving for master to a different country
  - Students moving for job to a different country
- Chemistry degree programs in Europe have defined a Chemistry Eurobachelor and Euromaster

The market

- Informatics degree programs should move quickly, the “market” is already moving
- The number of people using computers is always increasing
- A large number of users are skilled users
- Italian workforce (out of 56 millions)
  - 1 million IT specialists
  - 4 millions “skilled” users
  - 11 millions generic users
- Professional Certifications are spreading
- Multi-national companies push for proprietary certifications

A certification initiative...

- EUCIP (European Certification for Informatics Professionals)
  - Core: 400 learning hours (compulsory for every professional)
  - Elective: 800 learning hours (industry driven, 22 profiles)

Towards european coordination

- Need of clarifying **to the general public** differences and relation between university education and professional certification
- Professional certification should complement university education in areas
  - Where technology moves fast
  - Which are outside local interest
  - That can facilitate entering the market

Towards european coordination

- Relation between university education and professional certification
  - We started in Italy to individuate mappings between university curricula and EUCIP profiles
- Relation between university education and job profiles
  - Agreement with national federation of IT companies (AITech-Assinform) together with GII
- Apply for EU funding of a european coordination initiative ?

- GRIN
  - http://www.di.unipi.it/grin
- Bollino GRIN
  - http://grin.informatica.uniroma2.it

...thanks !