

Software Engineering Disciplines In Computing Curricula - An Experience Of Two Romanian Universities

Bazil PÂRV

Department of Computer Science
Babeş-Bolyai University, Cluj-Napoca, Romania

Viorel NEGRU

Department of Computer Science
West University, Timisoara, Romania

Outline

- Introduction
- Informatics education in Romanian universities
- Learning from American/EU experience
- SE disciplines and academic programs
- Future plans
- Conclusions

Introduction



Introduction

Romanian academic environment

- 50+ state universities
- 40+ private universities
- “Universitaria” consortium
 - University of Bucharest UB
 - Al. I Cuza University of Iasi CUI
 - Babes-Bolyai University of Cluj-Napoca BBU
 - West University of Timisoara WUT

Informatics education in Romanian universities

Tracks

- Informatics – “classical” universities
- Computer engineering/science – technical universities
- Economics informatics – economic universities/faculties

Informatics education in Romanian universities

Informatics programmes

- 1971: Mathematics faculties (UB, CUI, **BBU**, **WUT**), undergraduate *Informatics*, 4 years
- 1990s: many other universities adopted *Informatics* programmes
 - undergraduate *Mathematics-Informatics*, 4 -5 years
 - graduate (advanced studies in) Informatics , 1 – 1.5 year
- 2000s (Bologna, 2005)
 - undergraduate programmes in Informatics, Mathematics- Informatics, 3 years
 - graduate programmes in Informatics, 2 years

Learning from American experience

- US
 - Seattle University, 1982 – first SE master program worldwide
 - SEI, Carnegie-Mellon
 - RIT
- Canada
 - University of Ottawa B.A.Sc in SE
 - McGill university
 - British Columbia

Learning from EU experience

- Imperial College, University of Sheffield, UK
 - First and second undergraduate SE programs, 1988
 - Programming courses targeted to SE
 - Software development methodologies
- ETH Zurich, Switzerland, Software Engineering Chair
 - Methodologies of teaching programming
 - Design by contract
 - Automatic testing
- Oxford – postgraduate SE – themes/aspects
 - SE methods
 - SE tools
 - Software and systems security

Learning from EU experience

- Faculty mobilities in Western Europe after 1990
 - France
 - Germany
 - Netherlands
 - Austria
 - Italy
 - Belgium
 - ...
- Visiting professors from Western Universities
- Research cooperation with Western Universities

SE disciplines and academic programs

Industry requirements

- New professions
 - Software engineers, developers
 - Testers, quality assurance people
 - Team leaders, project managers
- More non-technical skills
 - Team work
 - Professional communication
 - Leadership
- More SE-related disciplines
 - SE fundamentals
 - OOD and Design patterns, Software architecture
 - Software development methodologies
 - Software testing/Quality assurance

SE disciplines and academic programs

Student motivation

- Courses better targeted to labor market needs
 - Shorter insertion paths
- Attractivity
 - Better job opportunities
 - More than “programmers”
 - “Software Engineer” sounds great!

SE disciplines and academic programs

Improvement tracks

- Existing programming courses
 - Programming language support for SE
 - Introduction to Software Engineering
 - Small programming projects
- New SE-related disciplines
 - Software modeling, OO design, architecture design
 - Software development processes
 - Software V & V
- Team and individual work
 - Team projects
 - Individual projects on many programming courses with focus on analysis and design issues

SE disciplines and academic programs

ACM - CS 2008 SE topics – undergraduate programs

- **SE fundamentals, Software processes, Requirements specification** (Software engineering)
- **Software design** (OOP, **Design patterns, Advanced programming methods, HCI**)
- **Using APIs** (Programming environments)
- **Tools and environments** (**Software project management, CASE tools**)
- **Software V & V** (**Software testing, Software V & V**)
- **Software project management** (**Software project management, Team software project**)

SE disciplines and academic programs

ACM - CS 2008 SE topics – graduate programs

- **Software design** (Software architectures, Software design, HCI design, Framework design)
- **Requirements specification** (Software modeling, Behavioral modeling of software systems)
- **Software project management** (Processes and management in SE, Software project management)
- **Component-based computing** (Component-based programming)
- **Formal methods** (Models and formal methods in SE, Formal methods in programming)
- **Software reliability** (SE quality assurance)
- **Specialized systems** (Workflow technologies/systems, Distributed systems, Decision support systems)

SE disciplines and academic programs

ACM - CS 2008 SE topics not covered so far

- Software evolution
- Risk assessment
- Robust and security-enhanced programming

Future plans

- Master programmes with IBM – Rational
 - Business Intelligence
 - Service Science Education and Management
 - Smart cities project
- New SE master programme at **BBU**
- New SE topics/disciplines in both undergraduate and graduate programmes

Conclusions

- Inclusion of SE disciplines into computing curricula was beneficial for both students and employers
- Rise and development of new SE master programmes was successful in terms of
 - Attractivity
 - Industry acceptance

References

- Curriculum Guidelines for Undergraduate Degree Programs in Computer Science,
http://www.acm.org/education/education/education/curric_vols/cc2001.pdf
- Computer Science Curriculum Update,
<http://www.acm.org//education/curricula/ComputerScience2008.pdf>
- IEEE. *Software Engineering Body of Knowledge*, 2004.
http://www.swebok.org/ironman/pdf/SWEBOK_Guide_2004.pdf
- O. Dieste, N. Juristo and A.M. Moreno, How Higher-Education Systems Influence Software Engineering Degree Programs, *IEEE Software*, July/August 2004, 78-85.S.
- S. McConnell, *Professional Software Development: Shorter Schedules, Better Projects, Superior Products, Enhanced Careers*, Addison-Wesley, 2004.
- F. Meziane and S. Vadera, A Comparison of Computer Science and Software Engineering Programmes in English Universities, Proc. of the *17th Conf of Software Engineering Education and Training CSEET04*, 65-70.
- Academic Curriculum 2010-11, Department of Computer Science, Babes-Bolyai University, <http://www.cs.ubbcluj.ro>
- Academic Curriculum 2010-11, Department of Computer Science, West University of Timisoara, <http://www.math.uvt.ro>

Thank you!