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

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Outline

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• Informatics education in Romanian universities
• Learning from American/EU experience
• SE disciplines and academic programs
• Future plans
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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
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Thank you!