

## Mixing JCSE topics with Sommerville at Sarajevo

Klaus Bothe  
Novica Nosović

12th Workshop "Software Engineering Education and Reverse Engineering"  
Opatija, Croatia, 3<sup>rd</sup> - 8<sup>th</sup> September 2012

## Contents

- Overview: SE at Sarajevo in 2012
- Why JCSE?
- Some localizations ...
- Students feedback
- Examinations
- Summary

## JCSE: Applications in real lectures

- *Novi Sad*:  
2002-04: 2 times, English slides, 10 participants from industry,  
2003-05: graduate students, 12 students in average per year  
2004-12: undergraduate students, 65 students an average per year
- *Skopje*: English, 2 different courses since 2004
- *Plovdiv*: Bulgarian, 2 different curricula, 100 participants, since 2003,  
textbook in 2006
- *Kragujevac*: Serbian
- *Zagreb (Dubrovnik)*: Croatian, 1 topic
- *Timisoara*: Romanian, 1 topic
- *Berlin*: 4 times (transparencies) + 8 times (ppt), German,  
80 participants
- *Belgrade (Faculty Elec. Eng.)*: 2005, 2006, Serbian slides, 12 topics,  
133 participants in 2005
- *Rijeka*: since 2009
- *University of Tirana*: 2007 (short version: 12 lh)
- *Polytechnic University Tirana*: 2007 – 2012, master studies, intensive course
- **Sarajevo: 2012, mixed course (4 topics JCSE + 8 topics Sommerville)**

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## JCSE: Application at Sarajevo – module data

- Sarajevo: 2012, mixed course “Software Engineering”  
4 topics JCSE + 8 topics Sommerville  
delivered by guest lecturing (Klaus Bothe)  
and local lecturing (Novica Nosovic)

### Module “Software Engineering”

- University of Sarajevo, Faculty of Electrical Engineering, Department Computing and Informatics
- Bachelor
- Semester 6
- Module type: mandatory
- ECTS 5
- Workload 60 hours
- Lectures 35 (3 \* 45 minutes per week, 12 weeks)
- Exercises 25
- Summer semester (20 February – 25 May 2012)

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## Questions: JCSE application at Sarajevo

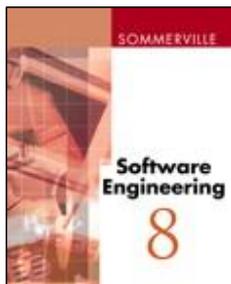
- Sarajevo: 2012, mixed course "Software Engineering"  
4 topics JCSE + 8 topics Sommerville  
delivered by guest lecturing (Klaus Bothe)  
and local lecturing (Novica Nosovic)

### Questions:

- Is it possible at all to combine two rather different sources into one course?
- If there is one source – Sommerville - as the basis, why at all to include another one - JCSE?
- What is the experience?

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## SE at Sarajevo 2011: based on Sommerville 8

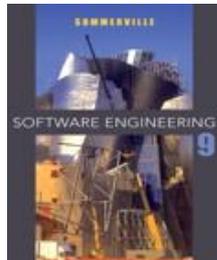


### Contents:

1. Introduction to SW and SE
2. Socio-technical Systems
3. Software Processes
4. Project management
5. Configuration management
6. Software Requirements
7. System models
8. Architectural Design
9. Object-oriented Design
10. Rapid software development
11. Software Reuse
12. Software testing
13. Security Engineering
14. Aspect-oriented Software Development

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## SE at Sarajevo 2012: JCSE + Sommerville 9



- Contents:
1. Introduction
  2. Software processes
  3. Requirements engineering
  4. Agile software development
  5. System modeling
  6. Architectural design
  7. Design and implementation
  8. Software testing:
    - Introduction and functional testing
  9. Software testing:
    - Structure-oriented testing
  10. Software evolution
  11. SW project management
  12. Version control

**JCSE**  
**Joint**  
**Course on**  
**Software**  
**Engineering**

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## SE at Sarajevo 2012: JCSE + Sommerville 9



- Contents:
1. Introduction
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**JCSE**  
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**Engineering**

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- Possible at all to combine two different sources into one course?  
**YES**

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# Software Engineering

University of Sarajevo in 2012



1. Introduction
2. Software processes
3. Requirements engineering
4. Agile software development
5. System modeling
6. Architectural design
7. Design and implementation

**Bothe: JCSE**

Each topic: 3 \* 45 minutes

21 and 22 February 2012

Humboldt University:  
Winter semester ending 17 February

**Nosovic: Sommerville**

8. Software testing: Introduction and functional testing

9. Software testing: Structure-oriented testing

**Bothe: JCSE**

10. Software evolution
11. SW project management
12. Version control

24 and 25 April 2012

**Nosovic: Sommerville**

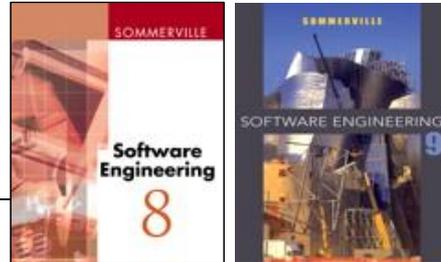
## Contents



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- Some localizations ...
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## Sommerville as the basis



### Sommerville:

- Internationally widespread textbook
  - 9 editions
  - Updated and extended in each version
  - Website with course material
- 
- Hard to teach (*my personal opinion*):
    - more top-level knowledge
    - does not go into depth

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## JCSE as the basis

**JCSE**  
Joint  
Course on  
Software  
Engineering

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### JCSE:

- Result of discussion and joint development (of different groups)
- Practical case study used in lectures and assignments
- Goes into depth in many topics (requirements, OOA, testing, metrics)
- Comprehensive teaching materials: slides, assignments, exams, case studies ...
- Motivating didactical material (pictures ...)
- Interactivity: questions to students included in lecture slides

- 
- Disadvantage: only German textbook (+ Bulgarian)

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## Why at all JCSE at Sarajevo – in addition to Sommerville ?

- New aspects in a Sommerville-based course
- Detailed treatment of some important topics: software processes, testing
- Use of advantages of JCSE
- New experience with the JCSE
- Discussion with colleagues at Sarajevo
- Guest lecturing for local students

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## JCSE: adaptation and extension of materials

1. Introduction

2. Software processes

**Bothe: JCSE**

3. Requirements engineering

4. Agile software development

5. System modeling

6. Architectural design

7. Design and implementation

8. Software testing: Introduction and functional testing

9. Software testing: Structure-oriented testing **Bothe: JCSE**

10. Software evolution

11. SW project management

12. Version control

*Not: take the JCSE  
materials and use them*



## JCSE: adaptation and extension of materials for Sarajevo

1. Introduction

2. Software processes

**Bothe: JCSE**

- Refreshment of JCSE: „Old“ materials exchanged
- Dedicated material for students of Sarajevo  
(e.g. Top 10 job killers in software engineering)

Examples follow

*Not: take the JCSE  
materials and use them*



# Extension + update of JCSE

## Topic 1: Introduction ... and motivation

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34th International Conference on Software Engineering

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**Sustainable Software for a Sustainable World**

The world's demand for software has become so huge that it can only be satisfied by building sustainable software. Conversely, a sustainable world needs more software than ever. Providing this

**The world's demand for software has become so huge that it can only be satisfied by building sustainable software. Conversely, a sustainable world needs more software than ever.**

the most recent innovations, trends, experiences and issues in the field of software engineering.

We welcome you to come to ICSE 2012 in Zurich, a venue in the heart of Europe which is both beautiful and easily reachable from everywhere in the world. Make ICSE 2012 a highlight of your year by experiencing an exciting conference and by exploring the thrill of landscape, culture, shopping, and life in Zurich.

**News**

New co-located event: Book Launch & Dinner in Honor of Judith Bishop  
15.01.2012, 21:58

Google declares Bronze

**“sustainable”:**

- long-lasting
- with a long life
- enduring

**quality properties:**

- maintainable
- reusable
- well-structured

34th International Conference on Software Engineering  
**2012**

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ICSE 2010, 2011, 2013

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### Karriere bei Bosch

SW Entwickler Anwendungssoftware (m/w)

**Job name**

**The company**

Jeder Erfolg hat seine Geschichte.

SB LiMotive ist ein Gemeinschaftsunternehmen des führenden Batterieherstellers Samsung SDI und des führenden Kraftfahrzeug-Erstausrüsters Bosch. Ziel von SB LiMotive ist die Entwicklung, Herstellung und der Vertrieb von Lithium-Ionen-Batterien für Anwendungen in der Automobiltechnik. Mit der Gründung von SB LiMotive zeigen beide Unternehmen, dass sie auf lange Sicht Partner im Bereich Elektromobilität sein möchten.

**Your tasks**

**Ihre Aufgabe:**

- Entwurf und Realisierung von Anwendungsfunktionen eines Batteriesteuergerätes
- Verfeinerung und der Funktionsmodelle der Anwendungsfunktionen
- Optimierung der Funktionsmodelle für die automatische Codegenerierung und/oder Umsetzung der Funktionsmodelle in C
- Mitarbeit bei der Definition von Testfällen für die Funktionsmodule
- Durchführen von Modultest für die Funktionsmodule
- Durchführen von Reviews

## Job offer from BOSCH, Stuttgart

### 19 May 2011

<http://www.it-jobs.stepstone.de/>

**Jetzt online bewerben!**

**Ihr Profil:**

- Hochschulabschluss in Technischer Informatik, Informatik o.ä.
- 2-3 jährige Erfahrung in der Serienentwicklung von SG-Software im Automotive-Umfeld,
- Sehr gute Kenntnisse im Umgang mit MatLab/Simulink,
- Sehr gute Kenntnisse in der Programmiersprache C sowie im SW-Engineering,
- Sehr gute Kenntnisse in Steuergeräte- und Embedded-Software-Architekturen,
- Fundierte Erfahrungen im Umgang SW-Entwicklungswerkzeugen (z.B. DOORS, KM-Tools),
- Selbstständiges und zielorientiertes Arbeiten, sowie Belastbarkeit, Initiative und Teamfähigkeit.
- Sehr gute englische Sprachkenntnisse.

**Karriere bei Bosch**

SW Entwickler Anwendungssoftware (m/w)

**Job name**

Software developer for application software (male / female)

**The company**

Joint venture between Samsung – Bosch: Development of Lithium-Ion-Batteries

**Your tasks**

**Ihre Aufgabe:**

- Entwurf und Realisierung eines Batteriesteuergerätes
- Verfeinerung und der Anwendungsfunktionen
- Optimierung der Funktione und Codegenerierung und Funktionsmodelle in C++
- Mitarbeit bei der Definition Funktionsmodule
- Durchführen von Modultests
- Durchführen von Reviews

**Your tasks:**

- Design of application functions of a battery control device
- Design of models for application functions
- Optimizing functional models for automatic code generation
- Design of test cases
- Modul test
- Reviews

**Job offer from BOSCH, Stuttgart 19 May 2011**

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**Your profile**

**Ihr Profil:**

- Hochschulabschluss in Technischer Informatik, Informatik o.ä.
- 2-3 jährige Erfahrung in der Entwicklung von Software im Automobilbereich
- Sehr gute Kenntnisse in C++ sowie im SW-Engineering
- Sehr gute Kenntnisse in der Software-Architektur
- Fundierte Erfahrung in der Entwicklung von Entwicklungswerkzeugen
- Selbstständiges und Belastbares und Teamfähigkeit.
- Sehr gute englische Sprachkenntnisse.

**Your profil:**

- Completed study in IT
- 2 -3 years of experience
- C language and software engineering
- Software tools
- ... initiative, team work
- English language

## Software Engineering for Bosnia and Herzegovina ... ?

... and for Albania, Croatia and ... other countries at the  
Balkan?

Points of discussion?

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## Software engineering might NOT be useful for BiH because ...

- ▶ ... it is useful only for the construction of large software
- ▶ ... it will be applicable only in big countries where large-scale software is being constructed
- ▶ ... the software constructed in BiH is not safety-critical (errors are not so serious)
- ▶ ... normally, software is taken and adapted in BiH, but not constructed
- ▶ ... software construction is not a big part of economy in BiH

**Good reasons?**

## Software engineering might be useful ALSO for BiH because ...

- ▶ Outsourcing (Example): EU companies delegate software projects to other countries (e.g. Balkan) ...
- ▶ All kinds of software projects – even smaller ones - need principles of software engineering (e.g. sound software architectures, systematic testing)
- ▶ ICSE 2012: “A sustainable world needs more software than ever...”
- ▶ [„Top Ten Idea Killers in Software Development“](#) (IEEE, Oct. 2011)

### **10 reasons not to be better in software development**

10. *“This is good enough”* in Albania and BiH ☹ : “The fact is that *nothing is ever good enough, least of all software.*”

9. *“This is how it was always done:* This is an anachronism in any competitive, rapidly changing field but particularly in software.”

3. *“No one is asking for it:* Human beings are incredibly adaptable -- they will live with anything”



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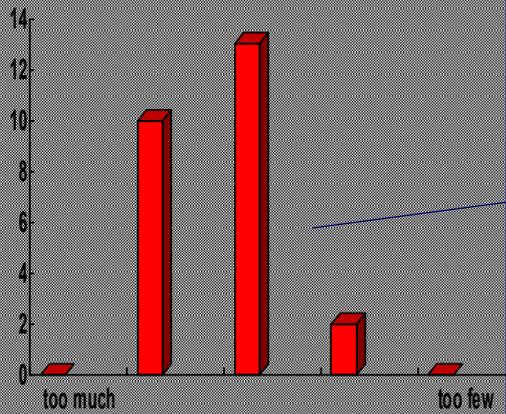
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## Feedback from students (questionnaire)

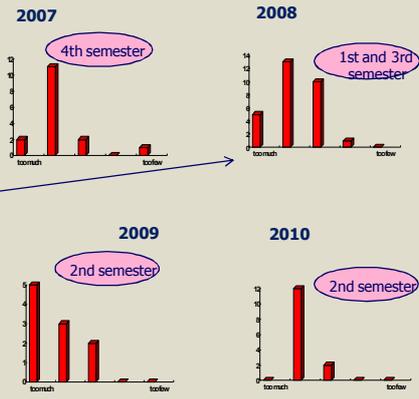
Only some examples

## How do you consider the amount of knowledge offered in the lectures?

Sarajevo 2012:  
4 lectures, Bachelor



Tirana 2007 - 2010:  
whole course, Master

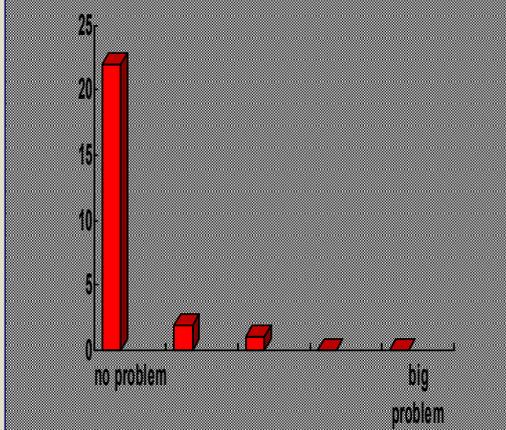


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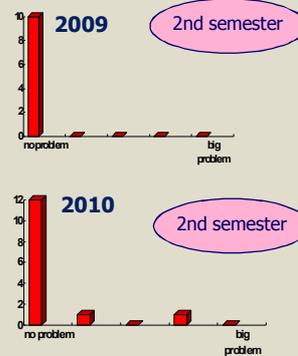
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## Was it a problem that slides and presentation were in English language?

Sarajevo 2012:  
4 lectures, Bachelor



Tirana 2007 - 2010:  
whole course, Master

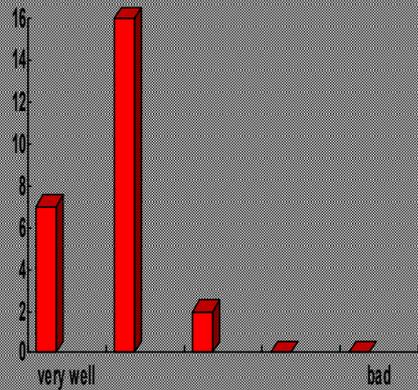


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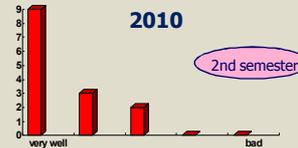
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## What is your overall ranking of the lecture?

Sarajevo 2012:  
4 lectures, Bachelor



Tirana 2007 - 2010:  
whole course, Master



## Textual remarks from students:

What should be changed the next time:

- Testing tools should be demonstrated
- Real-life examples (car industry) were very interesting
- More practical examples
- Nothing should be changed
- Keep it as this year

Our projects at the University of Sarajevo should include more testing activities.

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## Testing as part of the exam

- Structure-oriented testing

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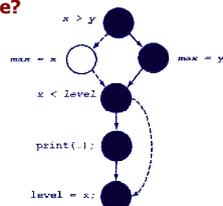
if (x > y)
    max = x;
else
    max = y;
if (x < level)
    print();
level = x;
    
```

Test cases:

variable input	x	y	level
1st testcase	1	50	100
2nd testcase	50	51	52

**Branch coverage?**

**Control flow graph?**



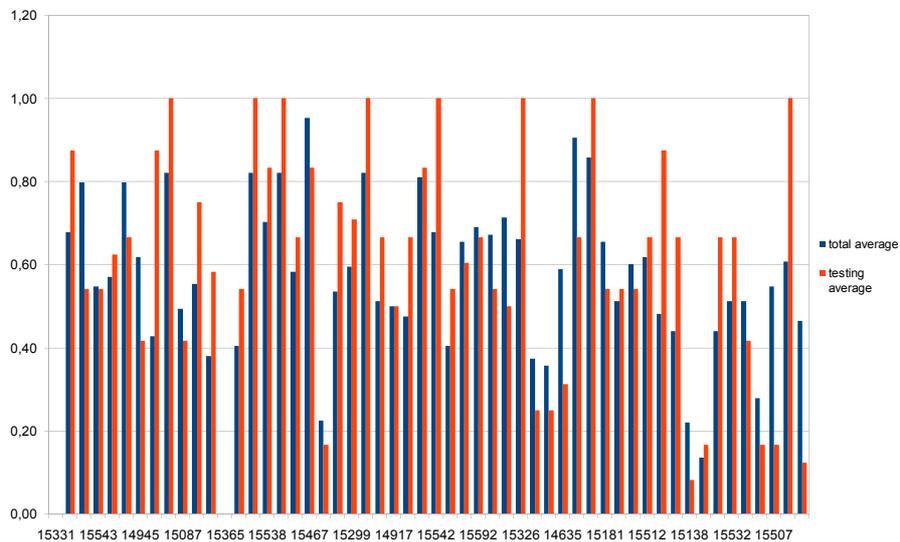
- Comparison: Functional and structured testing

- How are the test cases created during functional testing ("black box")?
- Which are the advantages and disadvantages connected with functional testing?
- Which is the practical approach of using white box and black box testing in practice?
- ....

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## Statistics of exams: general vs. testing

„Testing lesson fitted perfectly!“ (Novica)



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## Summary

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- Students were interested and co-operative
- Fruitful interactions between lecturer and students
- JCSE – contributed to some deeper insight into selected topics
- Testing not in the focus of the project at Sarajevo (application of learning contents would be interesting)
- Positive „experiment“ of JCSE application

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## Pictures

Sarajevo February 21 2012



Sarajevo April 24 2012



Sarajevo 2012: Olympic bob run from 1984



Thank you