



JCSE at Humboldt University in 2009

Klaus Bothe, Michael Ritzschke, Olga Schiemangk


9th Workshop "Software Engineering Education and Reverse Engineering"
Neum, Bosnia and Herzegovina, 31 August – 5 September 2009





Contents

- Website and staff
- Students
- Some features: guests, assignments, tools ...
- Students feedback
- Summary and conclusions

Neum, Bosnia and Herzegovina , 2009



Institut für Informatik
Softwaretechnik
Prof. Dr. Klaus Bothe 



Software Engineering

Summer semester 2009

Lec	Mon 13-15	(RUD 25, 3.00f)
Lec	Mon 15-17	(RUD 25, 3.00f)
Lec	Wed 13-15	(RUD 25, 3.00f)
Ass	Wed 08-11	(RUD 25, 4.11f)
Ass	Wed 11-13	(RUD 25, 4.11f)

Lecturer: [Prof. Dr. Klaus Bothe](#), Assignments: [Dr. Michael Bismuth](#), Support: [Prof. Math. Olga Schönmayr](#)

Remarks:

Schedule: In the beginning 3 lectures per week (for organizational reasons: earlier start of assignments), later 2 or 1 lecture per week.

No lectures: 13.5, 20.5, 22.6, 24.6, 29.6, 15.7

Examinations: 21.7.09, 22.7.09, 8-10.9.09, 7.10.09

Excursion: to Capgemini e&dm AG, Mon., 8. June 2009, 13.00, Kurfürstendamm 22, 10719 Berlin

[Questionnaire about tools usage \(digital form\)](#)

[Evaluation](#) ... of questionnaire about the lecture

[Student jobs](#)

Master theses: [Thema 1](#), [Thema 2](#), [Thema 3](#)

[1. Overview](#)

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[4. Case study SemOrg*](#)

[5. Assignments](#)

[6. Tools](#)

[7. Examination questions*](#)

[8. Guest lectures*](#)

[9. Literature](#)


Related projects:


[DAAD Project 'Software Engineering Education'](#)


[NCTI Project 'Software reinsertion'](#)

[Project 'Human Machine Interaction in Real Time'](#)

Restricted access rights for participants of the lecture.
Authentication required, username and password of your mobile account.
In case of problems, please, contact [Olga.Schoenmayr](#).



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Organization

Announcements

Course material


 Institut für Informatik
 Softwaretechnik
 Prof. Dr. Klaus Bothe

Software Engineering

Summer semester 2009

Organization

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Lecture: [Prof. Dr. Klaus Bothe](#). Assignments: [Dr. Michael Ritzschke](#) Support: [Dipl.-Math. Olga Schiemangk](#)

Klaus Bothe:


- Coordination
- Lectures:
28 lect.
(90 minutes)
in 14 weeks
- Examinations (oral)



Michael Ritzschke:

- Assignments:
assessments
- Conduct classes
to evaluate the
assignments

Olga Schiemangk:

- Software tools
(installation)
- Website
(built-up,
access rights)


 Institut für Informatik
 Softwaretechnik
 Prof. Dr. Klaus Bothe

Software Engineering

Summer semester 2009

Summer semester:

14 weeks

13 April
– 18 July 2009

Schedule:

In the beginning
3 lectures per week,
later 2 or 1
(reason: to start with
assignments earlier)

Lec	Mon 13-15	(RUD 25, 3.001)
Lec	Mon 15-17	(RUD 25, 3.001)
Lec	Wed 13-15	(RUD 25, 3.001)
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Lecture: [Prof. Dr. Klaus Bothe](#). Assignments: [Dr. Michael Ritzschke](#) Support: [Dipl.-Math. Olga Schiemangk](#)

Remarks:

Oral exams:
8 days offered

- July: 3
- September: 3
- October: 2

Schedule: In the beginning 3 lectures per week (for organisational reasons: earlier start of assignments), later 2 or 1 lecture per week

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Questionnaire about tools usage ([digital form](#))

Evaluation * of questionnaire about the lecture

Student jobs

Master theses: [Theme 1](#), [Theme 2](#), [Theme 3](#)



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- | | | |
|------------------------------------|---------------------------------------|-------------------------------------------|
| 1. Overview | 4. Case study SemOrg* | 7. Examination questions* |
| 2. Contents | 5. Assignments | 8. Guest lectures* |
| 3. Lecture slides* | 6. Tools | 9. Literature |

Related projects:

- [DAAD Project 'Software Engineering Education'](#)
- [XCTL Project 'Software renovation'](#)
- [Project 'Human-Machine Interaction in Real-Time'](#)

Restricted access rights for participants of the lecture.*
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In case of problems, please, contact [Olga Schiemangk](#).

Overview: Advertizing for the course

Software Engineering

Prof. K. Bothe

Summer semester 2009

Overview

SE is concerned with practical methods for developing complex software systems.

The course introduces into the domain and gives an overview of software engineering areas.

We would therefore recommend to attend this lecture as a guideline before advanced study period, but it is also useful as business preparation at the end of your study.

Topics:

- Software process models (Waterfall model, Spiral model, Prototyping, ...)
- Quality criteria for software products
- Standardization of software development process (ISO 9000, ...)
- Cost estimation (function point analysis, ...)
- Basic concepts and software development documents
- Requirements Engineering, Feasibility study and product model
- Formal software specifications and program verification (Z, Algebraic, Hoare)
- Software architecture
- Object-oriented analysis and design
- Structured analysis and design
- CASE (computer-aided software engineering)
- Implementation: Principles, methods, guidelines
- Systematic testing (Classification, review/audit, control-flow, data-flow oriented)
- Reverse engineering (Software repair, Reengineering, Restructuring, Maintenance)
- Software metrics (McCabe, Halstead, LOC, OO, CAME-Tool, MC-Tool)
- Introduction to software ergonomics

For selected subjects presentations of partners from the industry are involved.

Assignments and practical work with tools are part of the course.

One illustrated case study is used throughout the lecture.

Contents

Software Engineering

Prof. K. Bothe

Summer semester 2009

Contents

Part I: Introduction to software engineering

1. What is Software engineering?
(Motivation, Areas, Definition, History)
2. Quality criteria for software products
(Classifications, definitions, ISO 9126)
3. Software process models - introduction
(Activities of software development, overview of models, Waterfall model, Prototyping, ...)
4. Basic concepts and software development documents
(Overview and cross analysis)

Part II: Analysis and definition (Requirements engineering)

5. Results of the Analysis and Definition phase
(Feasibility study, Product model, Requirement document)
6. Cost estimation
(Costs, factors, function point analysis)
7. Basic concepts of the function-oriented view
(Function trees, Data flow diagrams)
8. Basic concepts of data-oriented view
(Jackson diagram, Entity relationship)
9. Basic concepts of rule-oriented view
(Rules, Decision tables and trees)
10. Structured analysis
(Context diagram, DFD-Hierarchy, Mini-specification, Implicit function tree)

All topics of
the JCSE

With the exception
of Software ergonomics

Slides

Lecture slides

Lecture slides are made available as pdf-files after lectures.
 *.1s.pdf - original lecture slides (one slide per page, colored).
 *.4s.pdf - alternative (four slides per page, b/w).

Chapter	Slides
Part I: Introduction to Software engineering	
1. What is Software engineering? <i>(Motivation, Areas, Definition, History)</i>	1-1s.pdf ; 1-4s.pdf
2. Quality criteria for software products <i>(ISO 9126)</i>	2-1s.pdf ; 2-4s.pdf
3. Software process models - introduction <i>(Activities of software development, overview of models, Waterfall model, Prototyping, ...)</i>	3-1s.pdf ; 3-4s.pdf
4. Basic concepts and software development documents <i>(Overview and cross analysis)</i>	4-1s.pdf ; 4-4s.pdf
Part II: Analysis and definition (Requirements engineering)	
5. Results of the Analysis and Definition phase <i>(Feasibility study, Product model, Requirement document)</i>	5-1s.pdf ; 5-4s.pdf
IEEE Standard 1028-1997: Reviews	IEEE Standard 1028-1997.pdf
6. Cost estimation <i>(Costs, factors, function point analysis)</i>	6-1s.pdf ; 6-4s.pdf
7. Basic concepts of the function-oriented view <i>(Function trees, Data flow diagrams, ...)</i>	7-1s.pdf ; 7-4s.pdf
8. Basic concepts of data-oriented view <i>(Jackson diagram, Entity relationship)</i>	8-1s.pdf ; 8-4s.pdf

- 1 slide per page coloured
- 4 slides per page (black/white)
- PDF
- After lectures
- Access-protected

Case Study SemOrg

Software Engineering

Prof. K. Bothe

Summer semester 2009

Case study SemOrg

Preliminary requirements specifications

- [Preliminary requirements specifications SemOrg v2.3.pdf](#)
- [Preliminary requirements specifications SemOrg v3.0.pdf](#)

Requirements specifications

- [Requirements specifications SemOrg v2.3.pdf](#)
- [Requirements specifications SemOrg v3.0.pdf](#)
- [Requirements specifications SemOrg v3.01.pdf](#)

Glossary

- [Glossary SemOrg.pdf](#)

User manual

- [HUSemOrg.pdf](#)

Implementation

- Installation hints ([HUSemOrg-Install.pdf](#))
- Program HUSemOrg ([HUSemOrg.zip](#))
- MySQL-batch-File ([husemorg_mysql_setup_db.sql](#))
- MySQL-Administrator-Tool ([mysql-administrator-1.1.9-win.ms](#))
- Class description ClientWindow ([pdf](#))

All information for
SemOrg collected:

- Documents
- Implemented system

Examination questions: 120

Software Engineering

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Summer semester 2009

Examination questions

[I. Introduction to software engineering](#)

[II. Analysis and definition](#)

[III. Design](#)

[IV. Implementation](#)

[V. Test](#)

[VI. Advanced problems](#)

Literature

Literature

Textbooks:

- H. Balzert: Lehrbuch der Software-Technik; Band1: Software-Entwicklung. Spektrum Akademischer Verlag, 1996
- H. Balzert: Lehrbuch der Software-Technik; Band1: Software-Entwicklung (2. Auflage). Spektrum Akademischer Verlag, 2000
- H. Balzert: Lehrbuch der Software-Technik; Band 2: Software-Management (2. Auflage). Software-Qualitätssicherung, Unternehmensmodellierung. Spektrum Akademischer Verlag, 2008
- E. Denert: Software-Engineering: Methodische Projektabwicklung. Springer, 1992
- P. Jalote: An Integrated Approach to Software Engineering, 2nd Edition, Springer 1997
- J. Ludewig, H. Lichter: Software Engineering, dpunkt Verlag für digitale Technologie G mbH 2006
- B.-U. Pagel, H.-W. Six: Software Engineering: Die Phasen der Softwareentwicklung. Addison-Wesley, 1994
- J.F. Peters, W. Pedrycz: Software Engineering: An Engineering Approach. John Wiley & Sons, 2000
- I. Sommerville: Software Engineering. Addison-Wesley, 8th Edition, 2006

Internet:

- MuSoFT: <http://musoft.cs.uni-dortmund.de:8080/musoft/index.html>
- SWENET: <http://www.swenet.org/>
- SWEBOOK - Software Engineering Body of Knowledge: <http://www.swebok.org/>
- IEEE Digital Library: <http://www2.computer.org/portal/web/csdl>
- ACM Digital Library: <http://portal.acm.org/dl.cfm>

Fundamental literature:

- R.S. Arnold: Software Reengineering. IEEE Computer Society Press, 1993
- G. Booch, I.Jacobson, J. Rumbaugh: The Unified Modeling Language User Guide. Addison-Wesley, 1999
- D. Burgartz: QM-Handbuch der Softwareentwicklung: Muster und Leitfaden nach DIN ISO 9001. Vieweg, 1995 (Muster-QM-Handbuch auf Diskette)
- The Capability Maturity Model: Guidelines for Improving the Software Process (Ed. Carnegie Mellon University, SED). Addison-Wesley 1995



Contents



- Website and staff
- Students
- Some features: guests, assignments, tools ...
- Students feedback
- Summary and conclusions

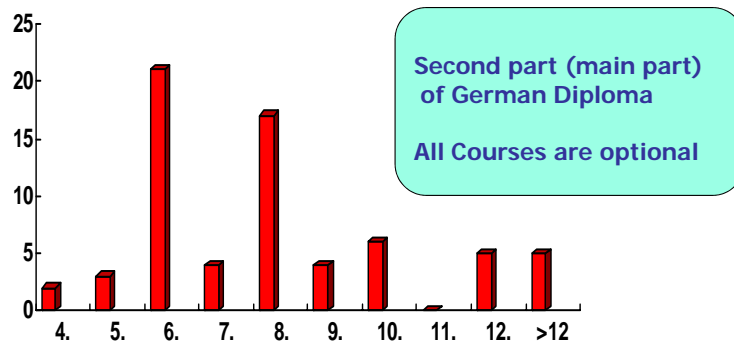
Students in 2009

- elective course in 2nd part of Diploma study -

- Enrolled: 69 (61 male + 8 female / 5 students from abroad, e.g. Erasmus: Ukraine, Spain)
- 21 teams: mostly with 3 members (17x3, 3x2, 1x4)
- Participated (at least one assignment): 62
- Accepted for exam (75 % points): 61
- Attendance in lectures: 50 – 40 – 35 – 30 – 25
- Enrolled for oral exam (8 different days): 57
 - July (2 weeks after lectures): 6 + 9 + 2
 - September (1 ½ month after lectures): 10 + 10 + 10
 - October: 6 + 4

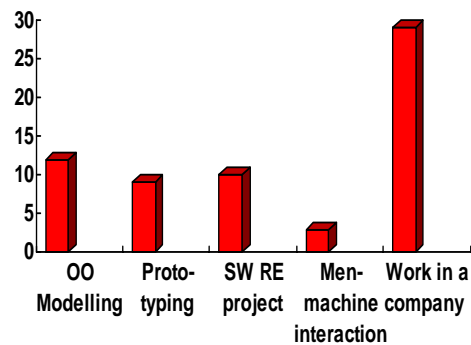
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Participating students: semester statistics



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Students statistics: pre-knowledge



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Guest lectures

Guest lectures (1)

Software Engineering

Prof. K. Bothe

Summer semester 2009

Guest lectures

Two guest lectures will be held to give insight into practical software development of companies.

Lecture 1: **Testing in Practice and Testing Tools**

Lecturers: Dr. Joachim Wegener and Herr Fitschinetz from Berner & Mattner

Date: 25. May 2009, 13:15 - 16:00 at the Institute of Informatics, HU

Contents:

This lecture gives insight into software testing for embedded automotive software.

In this field 50 - 70 percent of software development effort is connected with debugging and testing.

Thus, testing should be tool-supported.

The lecturers introduce two tools developed by DaimlerChrysler: CTE (Classification Tree Editor) and TESSY.

The CTE tool supports a functional testing approach to classify the input data space.

TESSY is a more integrated tool supporting test data selection, generation of test frames, execution and automatic evaluation of test runs.

Guest lectures (2)

Lecture 2: Professional Software Engineering of a Software House

Lecturers: diverse lecturers from Capgemini sd&m

Date: 8. June 2009, 13:00 - 16:00 at Capgemini sd&m AG, Kurfürstendamm 22, 10719 Berlin

Contents:

Capgemini sd&m is a leading company in Germany developing dedicated software according to the demands of customers. The following points will be focused:

- Specification in practice - tools and experience
- Quality management - Software quality cannot be assured by testing alone
- Requirements of industry to university education.

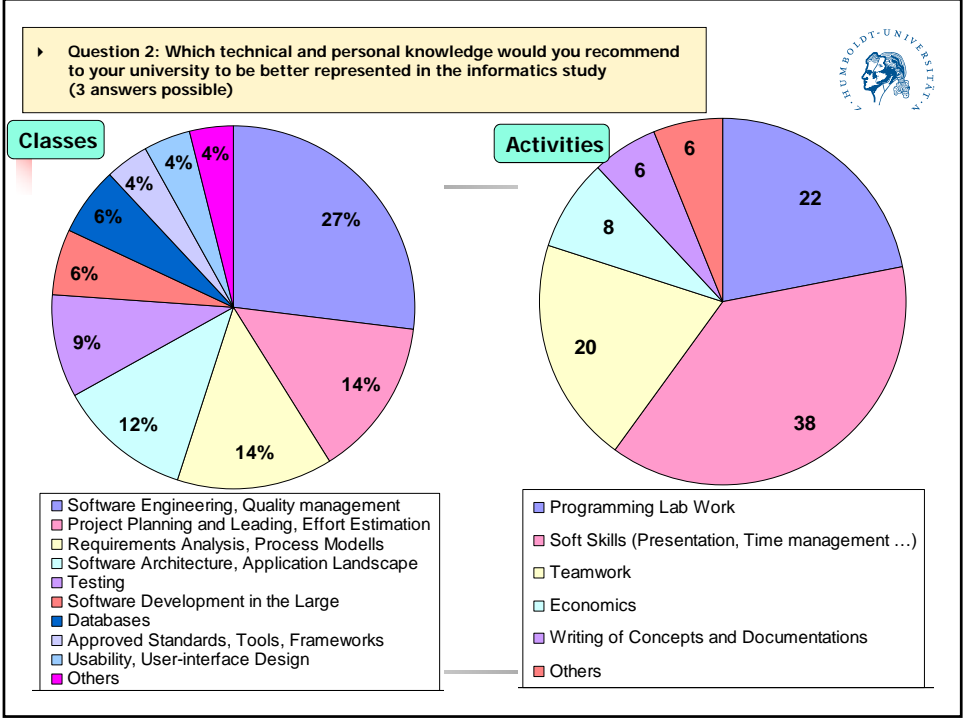
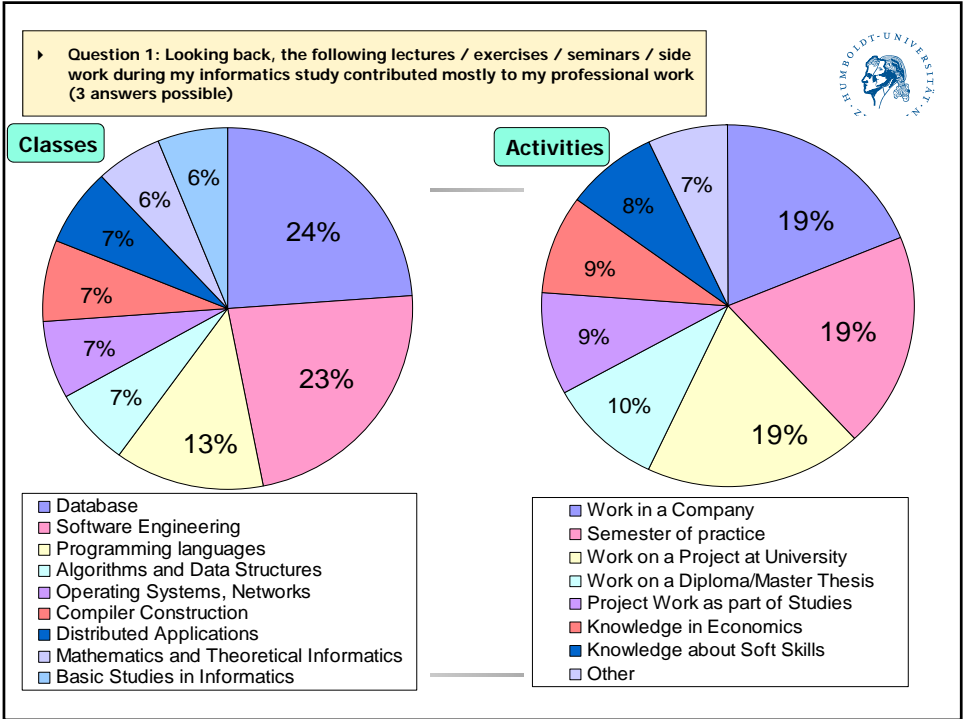


Importance of sub-areas of informatics

Questioning of young computer scientists working in practice at the German software company Capgemini sd&m (2008)

- ▶ **Question 1: Looking back, the following lectures / exercises / seminars / side work during my informatics study contributed mostly to my professional work (3 answers possible)**
- ▶ **Question 2: Which technical and personal knowledge would you recommend to your university to be better represented in the informatics study (3 answers possible)**

Source: Stephan Frohnhoff (sd&m): Requirements of Industry to an informatics curriculum (GI conference, Oct. 2008)





Conclusions from guest lectures

Students became more motivated for SE:

- Software engineering is a fundamental discipline of informatics
 - Tools are important / indispensable in practical software development (Message of both guest lectures)
 - Demonstration of a real-life tool used in car industry (CTE); later on applied in an assignment at our course SE
 - Quality management is an activity accompanying the whole software development process
 - Every day life of a software company requires
 - team work,
 - ability to understand a completely new application field,
 - negotiations with customers
 - mobility ...
-

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Assignments and Tools

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Assignments

Software Engineering

Prof. K. Bothe

Summer semester 2009

Assignments

Precondition for admission to examination: 75% of reachable points. 

Points: you can get maximum 10 points for each assignment.

Mode of delivery: printed on paper.

The annotated solutions to the assignments are distributed for discussion during the class and they are collected after the class as a basis for examination.

Teamwork: Assignment tasks are normally solved in groups of three people. Please talk about deviations to that rule with Dr. Ritzschke before.

Assignments overview

	Theme	Beginning	Delivery	Evaluation	Tool	Demo. in Lec.
Assignment 1	Review Requirements specifications	21.04.09	11.05.09	20.05.09	-	-
Assignment 2	Function point method	04.05.09	18.05.09	27.05.09	-	-
Assignment 3	OOA model	11.05.09	03.06.09	10.06.09	objectF	11.05.09
Assignment 4	Formal software specification	18.05.09	10.06.09	17.06.09	Z/EVES	-
Assignment 5	Classification tree method	25.05.09	15.06.09	01.07.09	CTE	25.05.09
Assignment 6	Test coverage	03.06.09	22.06.09	01.07.09	SOTA	03.06.09
Assignment 7	GUI oriented regression test	10.06.09	29.06.09	15.07.09	ATOSj	10.06.09
Assignment 8	Metrics	15.06.09	06.07.09	15.07.09	cccc	-

Tools

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Summer semester 2009

Tools

In the course of the lecture you will work with some software engineering tools. Several of them are demonstrated during the lectures.

OO CASE TOOL: [objectF](#)

TEST TOOLS:

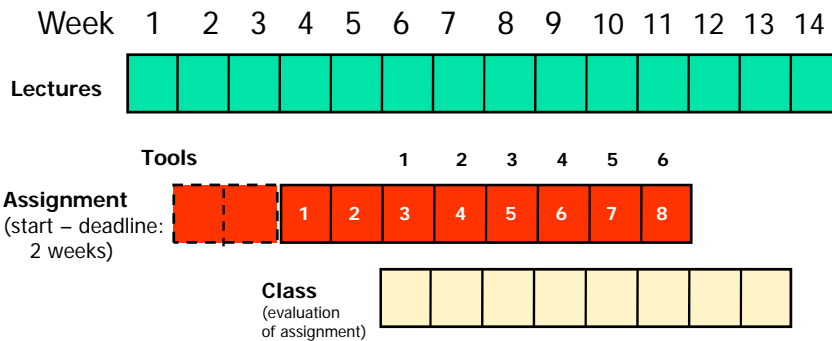
- [CTE XL](#) - Classification Tree Editor
 - [Users guide](#)
- [SOTA](#)
 - [Installation hints](#)
 - [User manual \(pdf, 1,9MB\)](#)
 - [Setup of test environment for SOTA assignment \(HUSemOrg\)](#)
 - [Setup of test environment for sample program1](#)
 - [Setup of test environment for sample program2](#)
- [ATOSj](#)
 - [Installation hints](#)
 - [User manual \(pdf, one slide per page, two slides per page\)](#)
 - [HTS language specification\(pdf file\)](#)
 - [Project setup for HUSemOrg](#)

Information about:

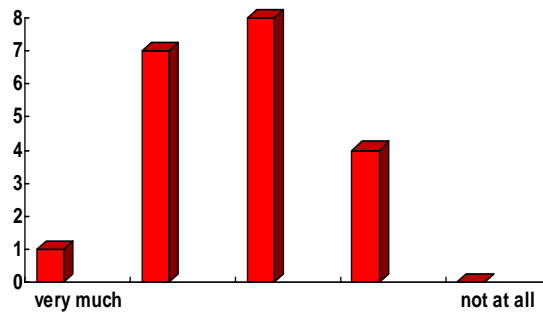
- [User manuals](#)
- [Installation guides](#)
- [Download information](#)

Z-SPECIFICATION: [Z/EVES](#)

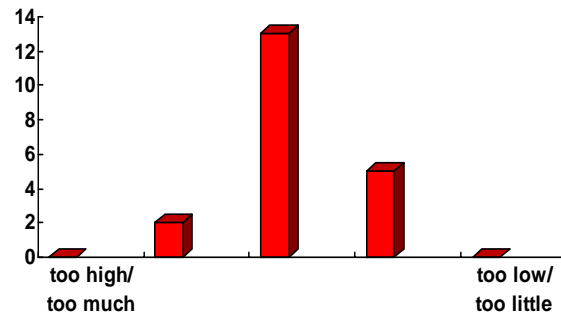
Schedule



Were you motivated by the assignments?

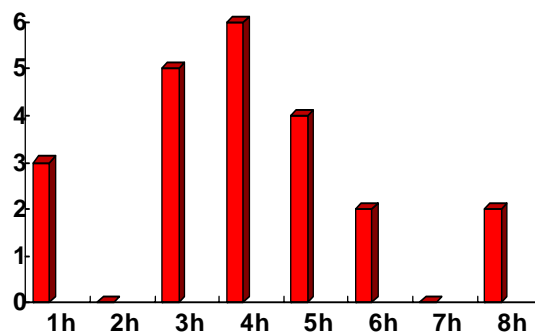


What about the difficulty and the extent of assignments?



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How many hours per week did it take you to solve assignments?



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- Students feedback (see: Tirana presentation)
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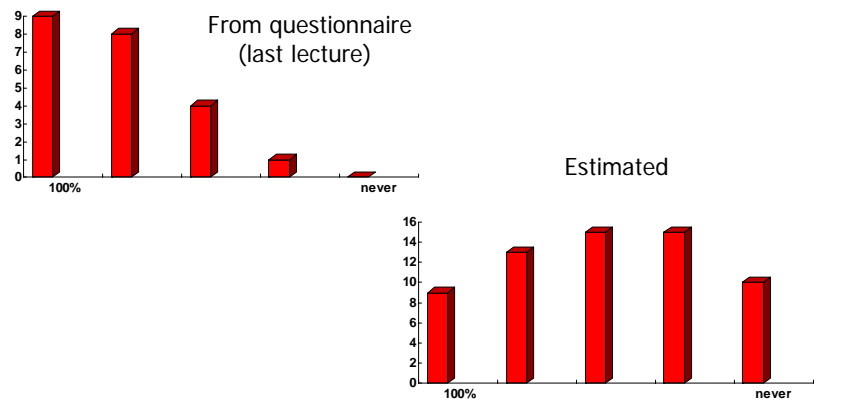


Students feedback
(see: Tirana presentation)

→ Skip next slides

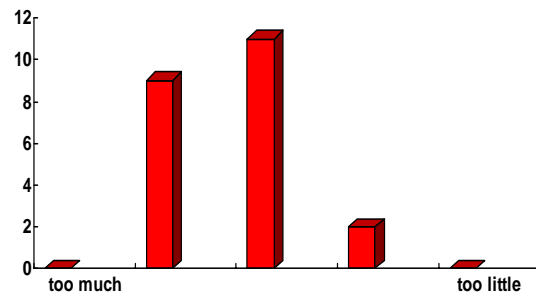
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How many lectures did you attend (percentage)?



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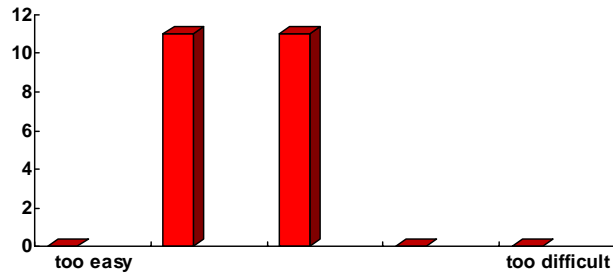
How do you consider the amount of knowledge offered in the lectures?



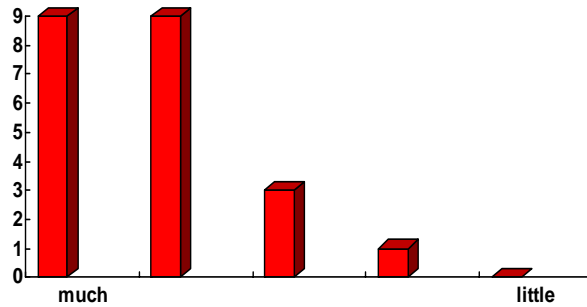
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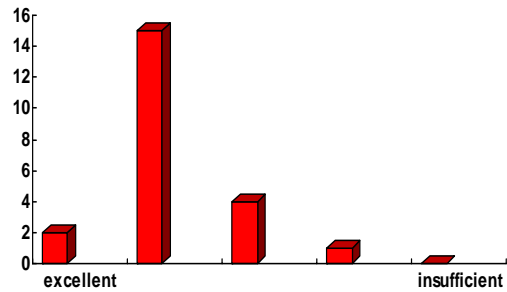
How do you consider the difficulty of the lectures?



Did you learn a lot of new things?



What is your overall ranking of the lecture?



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Summary

- Course with highest enrolment in summer semester at the institute (all are optional in 2nd part of diploma study)
- Students were motivated, but ...
- ... their attendance decreased over the semester
- Reasons:
 - excellent slides were sufficient;
 - half of them worked in industry;
 - at the end: preparation of a couple of different exams
- Tool-inclusion: much effort for staff and students, but ... see: the other presentation
- Guest lecturing: good for motivation and additional and complementary information

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Future: from Diploma to Bachelor (1)

Current state:

- SE in **Diploma curriculum** (9 semesters, until 2009) with
 - About 60 – 70 students
 - After basic phase (1 – 4 sem.):
 - Students from 5th – 9th (14th) semester
 - With practical experience in SW development
 - Optional course – participation by motivation!
 - Oral exams
 - Assignments with intensive tool usage

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Future: from Diploma to Bachelor (2)

Future state (WS 09/10):

SE in **Bachelor curriculum** (6 semesters, starting 2009)
with

- About 150 students: informatics, teachers, other disciplines (mathematics, physics, psychology ...)
- In 3rd semester
- Only partly with practical experience in SW development
- Obligatory course ☹
- Oral exams???
- Assignments with intensive tool usage???

Conclusion: more work and less fun for the staff? 😊

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