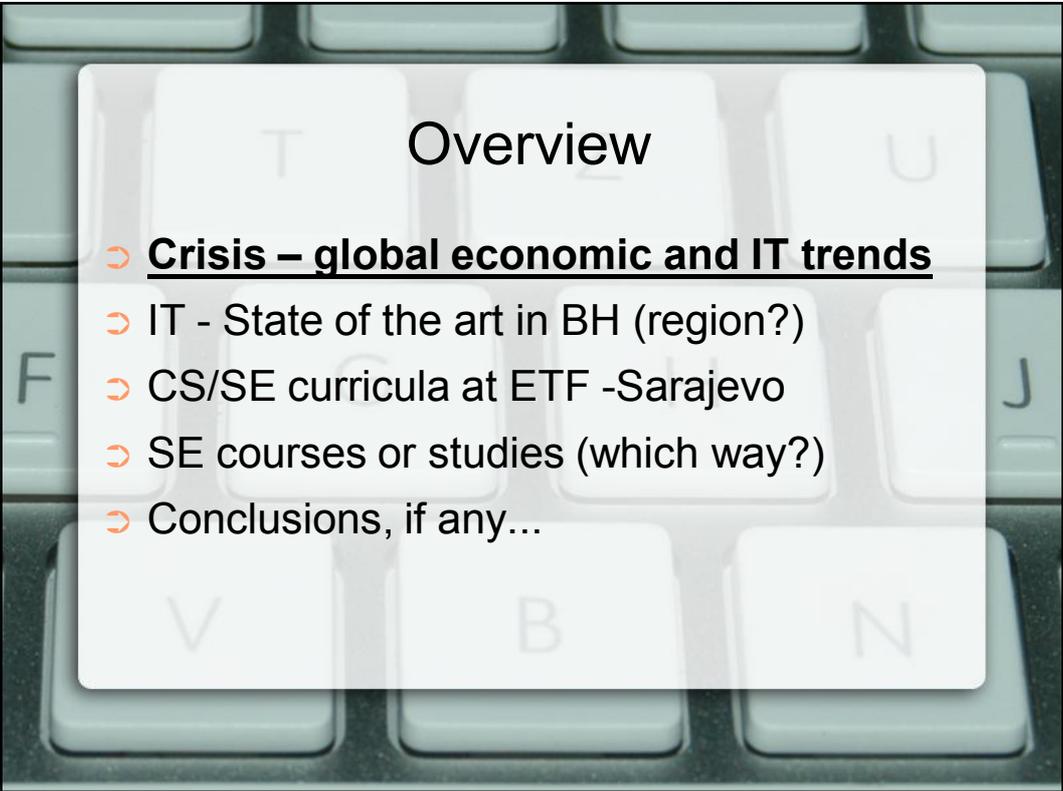




# IT Business in BH and CS/SE Curricula at ETF-Sarajevo

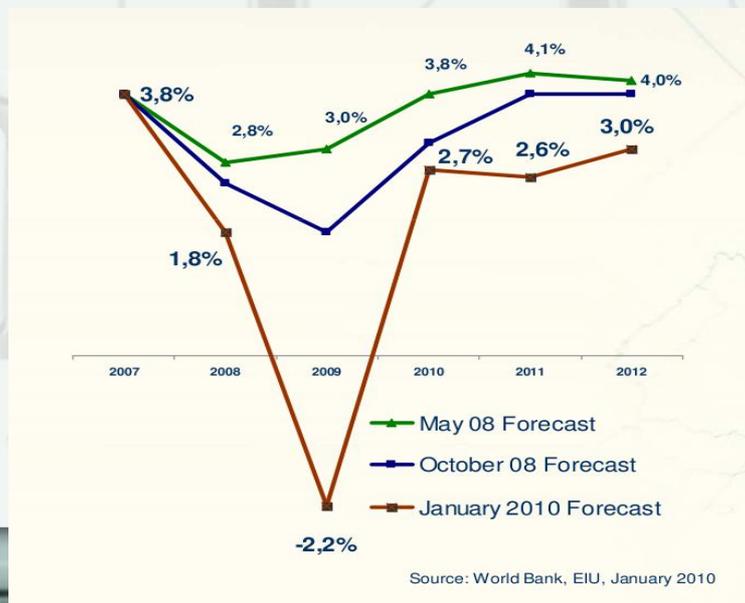
Novica Nosović  
ETF – Sarajevo, BH



## Overview

- **Crisis – global economic and IT trends**
- IT - State of the art in BH (region?)
- CS/SE curricula at ETF -Sarajevo
- SE courses or studies (which way?)
- Conclusions, if any...

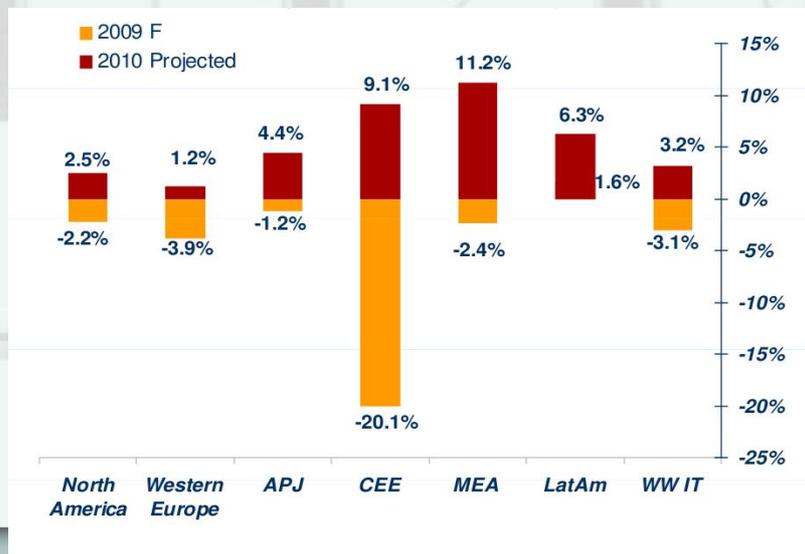
## WW GDP growth forecast



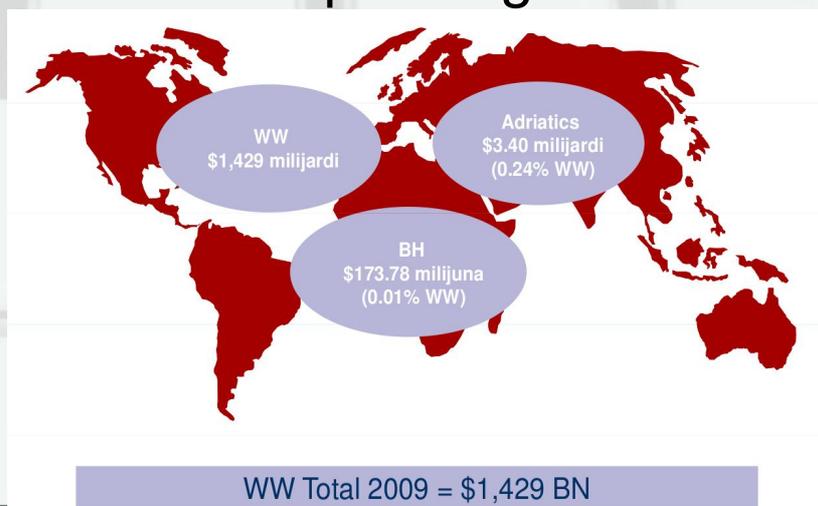
## WW IT spending forecast



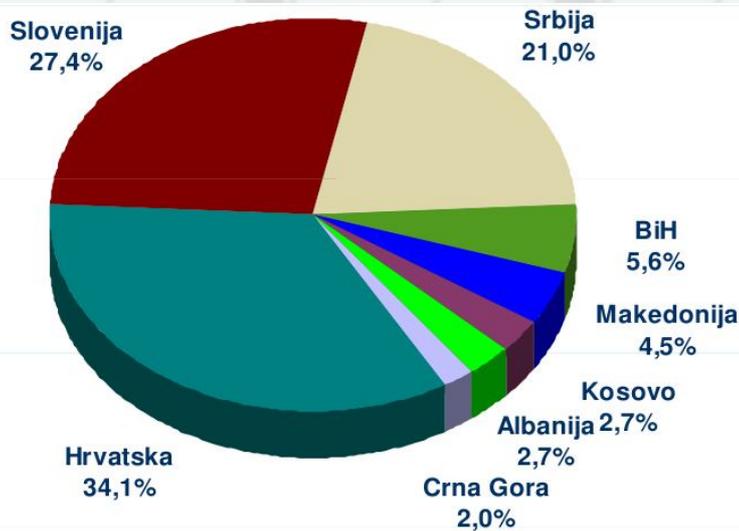
## WW IT spending forecast (II)



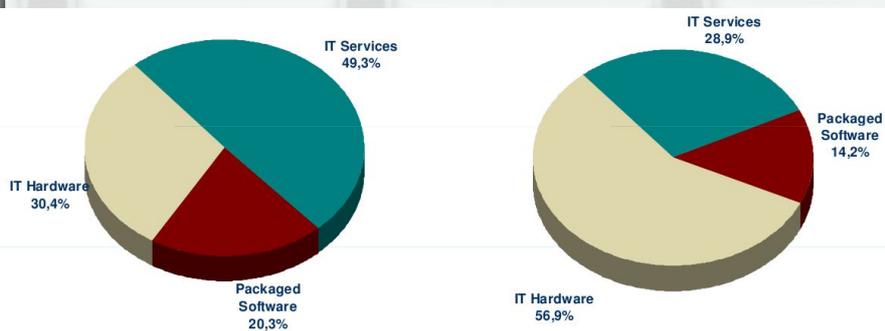
## Region and BH in WW IT spending



## IT spendings in the region



## IT spending in Europe



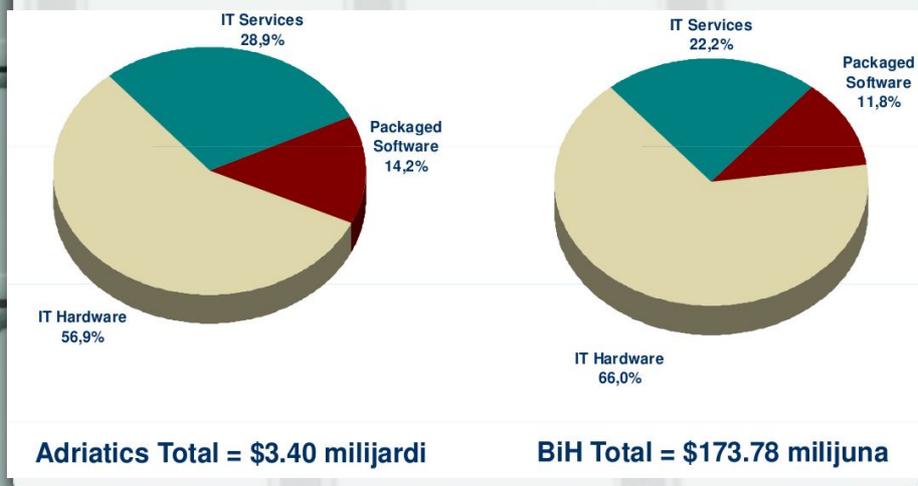
**WE Total = \$436.10 milijardi**

**Adriatics Total = \$3.40 milijardi**

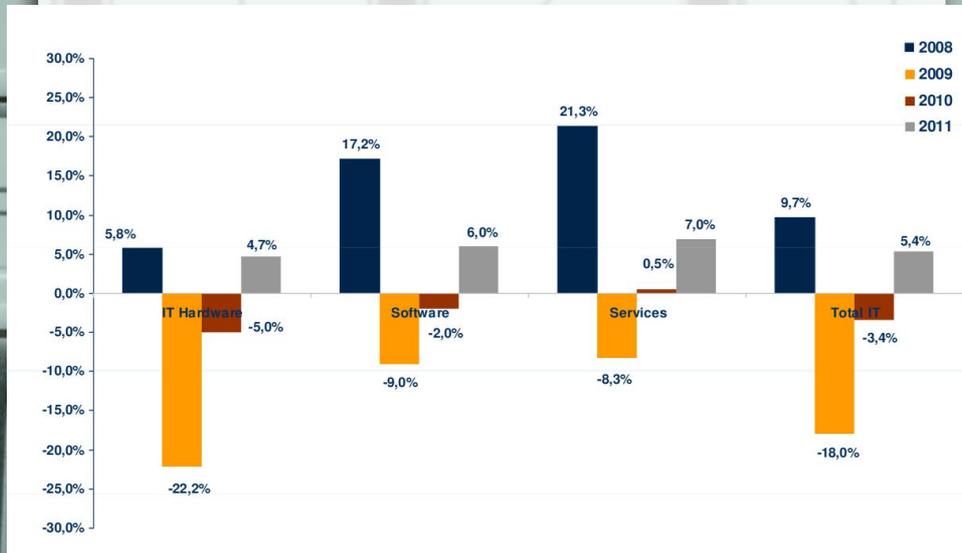
## IT spending per capita in the region



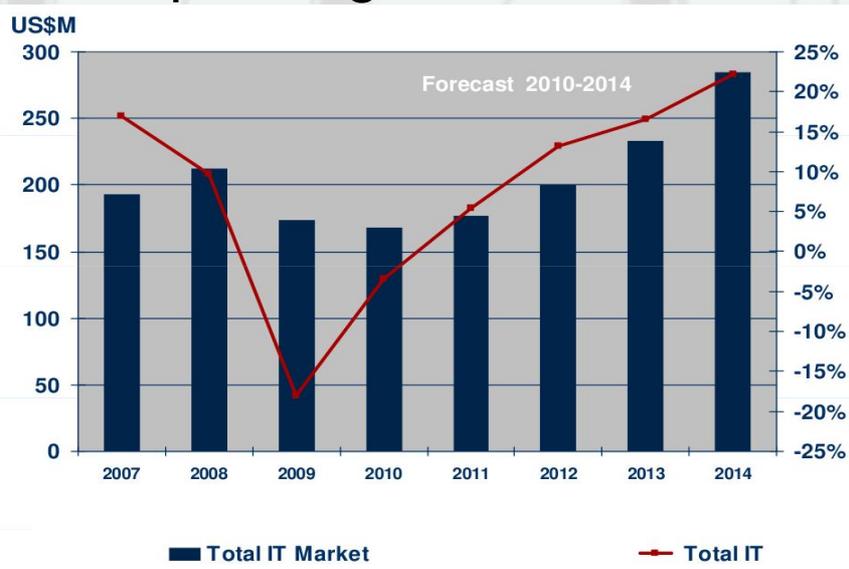
## The region vs. BH IT spending



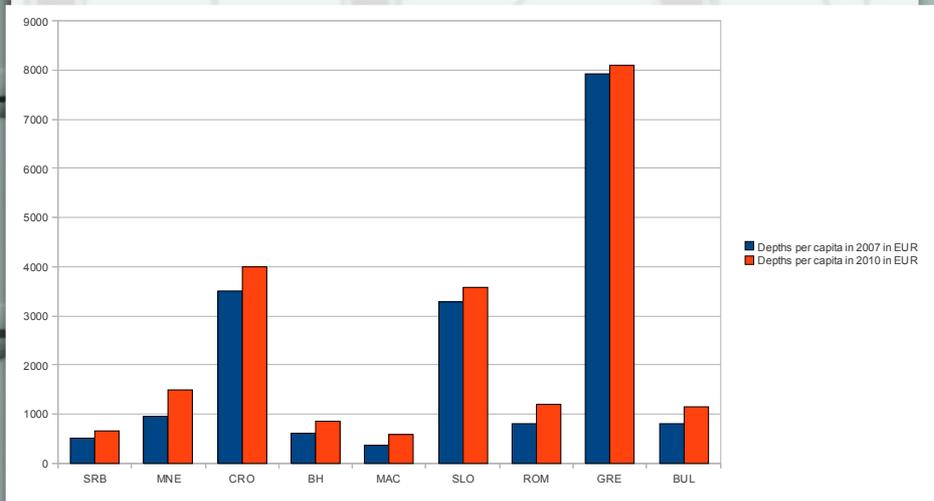
## IT spending in BH - trends



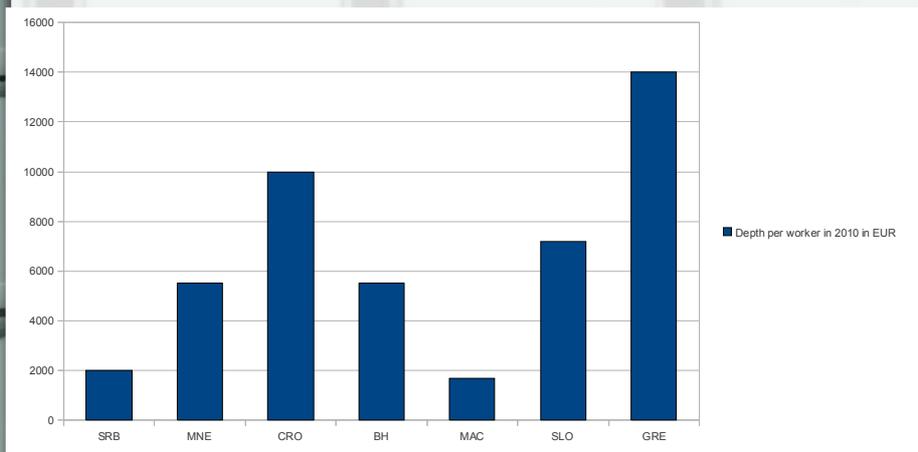
## IT spending in BH - forecast



## Debths per capita



## Debths per worker



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## Survey of SW businesses in BH

Company	Employees	Year starting	Core business	Technology
A	50	1997	Banking sw, HW dealer	Oracle
B	120	1996	Vodafone, HP outsource	.Net, mix
C	27	1989	E-government, ERP	Oracle/Open source
D	70	2000	GIS, Navtec outsource	Java, switching to Cloud...

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## CS curricula at ETF -Sarajevo

### I semester

N	Course Name	Course ID	ECTS	H/S	P	V	T
1	Math for Engineers I	PG 01	6,5	75	49	0	26
2	Basics of EE	PG 02	7,5	80	48	4	28
3	Physics for Engineers I	PG 03	5,0	60	39	0	21
4	Linear Algebra and Geometry	PG 04	5,0	60	39	0	21
5	Introduction to Computing	PG 05	6,0	70	44	26	0
Total:			30	345	219	30	96

### II semester

N	Course Name	Course ID	ECTS	H/S	P	V	T
1	Math for Engineers II	PG 06	7,5	80	52	0	28
2	Electric Circuits I	PG 07	6,5	75	45	10	20
3	Physics for Engineers II	PG 08	5,0	60	39	0	21
4	Programming Techniques	PG 09	6,0	70	44	26	0
5	Electronics Components and Circuits	PG 10	5,0	60	39	0	21
Total:			30	345	219	36	90

## II Year

### III semester

N	Course Name	Course ID	ECTS	H/S	P	V	T
1	Discrete Math	ETF RIO DM 2360	5,5	60	39	0	21
2	Operating Systems	ETF RIO OS 2360	5,0	60	28	22	0
3	Algorithms and Data Structures	ETF RIO ASP 2360	5,0	60	38	22	0
4	Programming Solutions Development	ETF RIO RPR 2360	5,0	60	38	22	0
5	Logic Design	ETF RIO LD 2360	5,0	60	40	20	0
6	Elective course 1		4,5	45			
Total:			30	345			

### Elective course 1

N	Course Name	Course ID	ECTS	H/S	P	V	T
1	System Programming	ETF RII SP 2345	4,5	45	30	15	0
2	Probability and Statistics	ETF RII VS 2345	4,5	45	30	0	15

### IV semester

N	Course Name	Course ID	ECTS	H/S	P	V	T
1	Computer Architectures	ETF RIO RA 2460	5,5	60	40	20	0
2	OO Analysis and Design	ETF RIO OOAD 2460	5,5	60	38	22	0
3	Introduction to Databases	ETF RIO OBP 2460	5	60	40	10	10
4	Introduction to Information Systems	ETF RIO OIS 2460	5	60	40	10	10
5	Elective course 2		4,5	45			
6	Elective course 3		4,5	40			
Total:			30	330			

### Elective courses 2 and 3

N	Course Name	Course ID	ECTS	H/S	P	V	T
1	Internet Economy	ETF RII IE 2445	4,5	45	30	15	0
2	CAD-CAM Engineering	ETF RII CCI 2445	4,5	45	30	15	0
3	Introduction to Telecommunications	ETF RII OT 2445	4,5	45	30	0	15
4	Project in Automatics and Informatics	ETF RII PAI 2445	4,5	45	10	30	0

## III Year

### V semester

N	Course Name	Course ID	ECTS	H/S	P	V	T
1	Operational Research Fundamentals	ETF RIO OOI 3560	5,5	60	40	14	6
2	Computer Graphics	ETF RIO RG 3560	5,0	60	36	16	8
3	Information Systems	ETF RIO IS 3560	5,5	60	38	38	11
4	Computer Networks Fundamentals	ETF RIO ORM 3560	5,5	60	40	14	6
5	Elective course 4		4,5	45			
6	Elective course 5		4,5	45			
Total:			30	330			

### Elective courses 4 and 5

N	Course Name	Course ID	ECTS	H/S	P	V	T
1	Digital Signal Processing	ETF RII DPI 3545	4,5	45	28	7	10
2	Computer Networks Administration	ETF RII ARM 3545	4,5	45	28	0	17
3	Automata and Formal Languages	ETF RII AFJ 3545	4,5	45	30	0	15
4	Mobile Communications	ETF RII MK 3545	4,5	45	30	8	7
5	Digital Control Systems	ETF RII DSU 3545	4,5	45	25	15	
6	Elective course from other schools		4,5	45			

### VI semester

N	Course Name	Course ID	ECTS	H/S	P	V	T
1	Software Engineering	ETF RIO SI 3660	5,0	60	35	25	0
2	Web Technologies	ETF RIO WT 3660	4,0	55	35	20	0
3	Artificial Intelligence	ETF RIO VI 3660	5,0	60	35	25	0
4	Elective course 6		4,0	45			
5	Graduation work	ETF RIO ZR 36110	12,0	110			
Total:			30,0	330			

### Elective course 6

N	Course Name	Course ID	ECTS	H/S	P	V	T
1	Software Quality Assurance	ETF RII PKKS 3645	4,0	45	30	15	0
2	Engineering and Control System Technology	ETF RII ITSU 3645	4,0	45	30	15	0
3	Optimization Algorithms	ETF RII OA 3645	4,0	45	30	0	15
4	Microprocessor System Design	ETF RII PMS 3645	4,0	45	30	8	7
5	Communication Protocols and Networks	ETF RII KPM 3645	4,0	45	30	10	5
6	Computer Modeling and Simulation	ETF RII RMS 3660	4,0	45	30	15	0

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## SE studies in general

- About 20 colleges and universities in the US offer accredited software engineering degree programs and dozens more have introduced programs
- Software engineering is loosely defined as the application of engineering concepts, techniques, and methods to the development of software systems

## SE vs CS

- SE is distinct from the field of CS, which draws on a strong theoretical foundation in mathematics, statistics, and computing to develop new, cutting-edge computing solutions

## SE vs CE

- SE is distinct from CE, which in general covers the design and construction of computers and computer-based systems.

## SE deals with large scale systems

- It is a team-oriented discipline!
- Its professionals need to know how teams work and they must have the organizational, technical, process, and people skills needed to be productive in a team environment
- They must have the ability to link software programs together and the know-how to measure the effectiveness of a team's performance and the finished product

## Skills required

- SW engineers must have a broad set of skills - to understand sw design at the architecture level and the subsystem level and be able to design at the code level, using knowledge from CS

## SW engineers are well paid (!?)

- Software engineers can expect to command high salaries - the intelligence industry is one of the highest-paying sectors (US!)
- In the other hand – who can call him or herself Software Engineer?

## SE - Licencing

- Because it's a new field, licensing requirements for sw engineers haven't taken root in the industry
- Texas require software engineers to pass a licensing exam if they want to promote themselves as sw engineers and some other states are moving in this direction

## SE outsourcing

People must understand:

The process of conceptualizing the problem and developing the design is still not exportable!!!

## Designing the (Introduction to) SE course at ETF-Sarajevo

- Requirements not clear
- No help from the government
- Back to basic engineering method – do not do big mistakes and do small ones freely!
- “Middle-of-the-road” approach in the course design – use the standard textbook (Sommerville, Pressman) and try to teach the most important basics and have as close to real life projects as possible

# Lessons sequencing problem

DAAD – JCSE

What is Software Engineering?  
Quality Criteria for Software Products  
Software process models  
Basic concepts for the description of software development  
Results of the „Analysis and Definition“ phase  
Cost Estimation  
Basic concepts of the functional view  
Basic Concepts of the Data Oriented View  
Basic Concepts of the Rule Oriented View  
Structured Analysis  
Basic concepts of state-oriented view  
Basic concepts of scenario-based view  
Object-oriented Analysis  
Formal specifications  
Overview of Design Phase  
Structured design  
Object-oriented design (OOD)  
Implementation: Programming Style and Methodology  
Systematic testing  
Functional Testing  
Software metrics  
Reverse Engineering  
Configuration Management  
  
Rational Unified Process  
Extreme programming  
Service Oriented Architecture  
Test-Driven Development  
Microsoft Project  
Personal software process (PSP)

Sommerville

An Introduction to Software Engineering  
Socio-technical Systems  
Critical Systems  
Software Processes  
Project management  
Software Requirements  
Requirements Engineering Processes  
System models  
Critical Systems Specification  
Formal Specification  
Architectural Design  
Distributed Systems Architectures  
Application architectures  
Object-oriented Design  
Real-time Software Design  
User interface design  
Rapid software development  
Software Reuse  
Component-based software engineering  
Critical systems development  
Software evolution  
Verification and Validation  
Software testing  
Critical Systems Validation  
Managing people  
Software cost estimation  
Quality Management  
Process Improvement  
Configuration management  
Security Engineering

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## Conclusions, if any...

- SE is not going to flourish in 108<sup>th</sup> country
- All we can hope for is to catch the train
- Do not teach things from fast changing areas – stick with sound fundamentals first!
- ...there is no long way down...

