
# Requirements and Architecture Modeling in Software Engineering Courses

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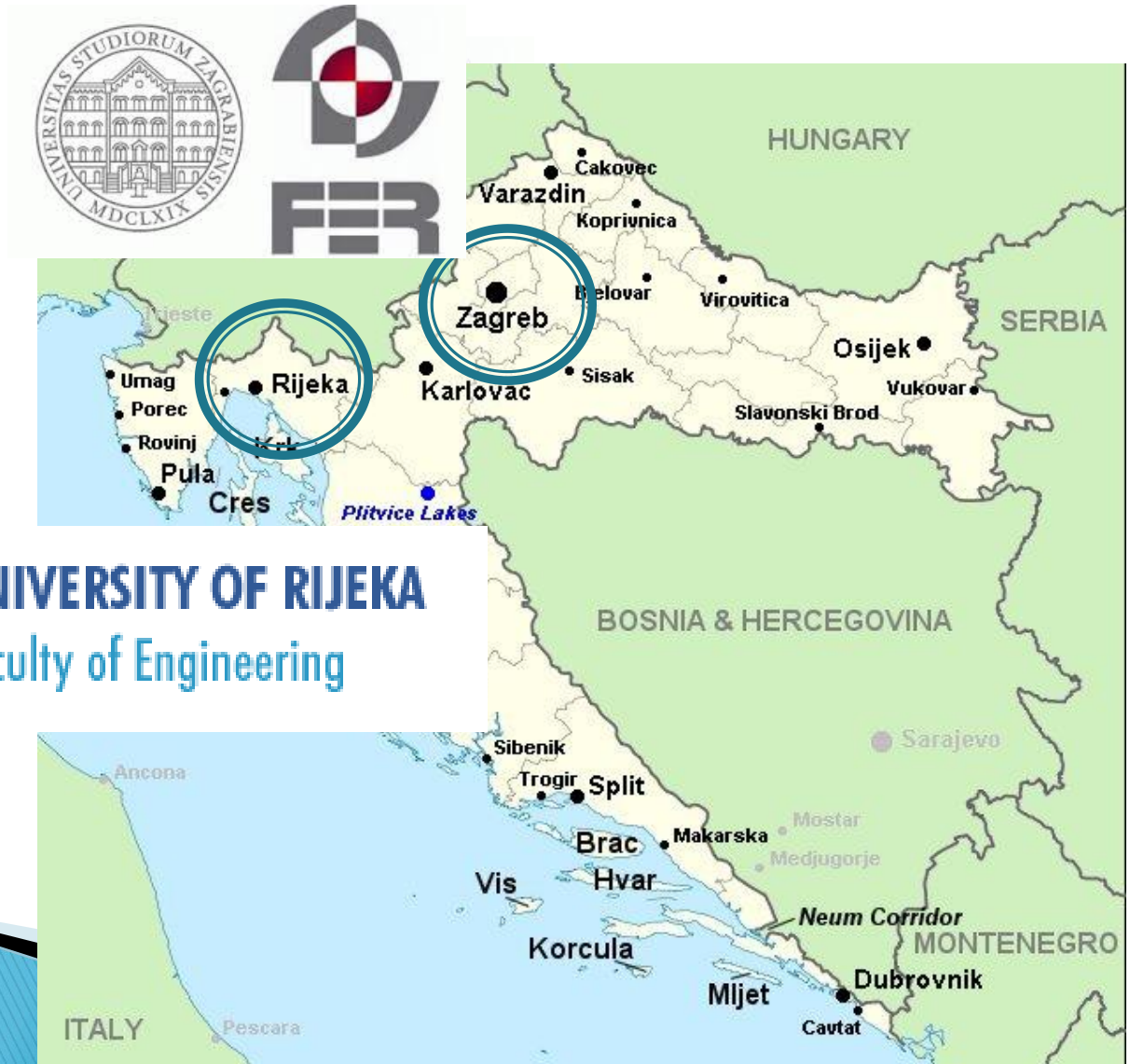
# Motivation

- In Software Engineering important is:
  - Understanding of the SRAM (software requirements and architecture modeling) process and the main purpose of these processes within the software lifecycle.
- When to study SRAM?
  - Majority of study curricula, courses with SRAM learning outcomes are left to final undergraduate level or graduate study programme
- Main problems learning SRAM?
  - students lack abstraction, industrial perspective and critical reasoning abilities

# We aim to

- Discuss learning approaches for requirements and architecture modeling
- Define effective learning strategies aiming to prepare students for real software engineering projects.
- Share best practices

# Case study

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# Case study

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*Course:*
*Software Engineering*
*Study programme:*
undergraduate *Computing*

*Course:*
*Telecommunication Software Development*
*Study programme:*
*graduate Telecommunications and Informatics*

# Software Engineering Course@RITEH

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- 2nd year (2nd semester) undergraduate, 7 ECTS
- Aim of the course:
  - introduces students to software lifecycle and related software engineering processes and activities.
- Course design:
  - 45 lecturing + 15 hour of laboratory work in 15 weeks period.
- Students:
  - On average 50 students attend
  - All are full time students and without previous expertise working in software development
  - low previous experience in programming, although they have basic programming skills in C.

# Software Engineering Course@RITEH

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- **Approach:**
- Lectures mostly follow van Vliet Software Eng. book
  - aiming to learn fundamentals related to software requirements analysis (1 week), and architecture modeling (1 week)
  - Involves lectures on UML (2 weeks)
- Laboratory work is organized in projects
  - 5-6 students in group, develop Android application (their choice)
  - Each student has its own role (project manager, software arhcitect, etc.)
- Methods and Tools
  - Document templates are tailored version of IEEE 830 and 1016 standards (based on years of industrial practice)
  - ArgoUML, Class Responsibility Collaboration Cards, week reviews
- Learnng strategy: lecture+project+reflections

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- **Experiences in working with students:**
- Students have problem to understand the difference between software requirements and software design process
- Level of abstraction is very limited
  - requirements rarely according to SMART* definition.
  - functions that could be generalized are often missed
  - Weak use object oriented concepts such as generalization, inheritance, encapsulation
- Do not understand definition of quality attributes
- Student use iterations as reaction to week meetings

*Simple, Measurable, Assignable, Realistic and Time related

# Software Engineering Course@RITEH

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- **Recommendations:**
  - Learning fundamentals based on minimal technology use
  - Learning based on examples
  - Frequent discussions, feadbacks with teacher
  - Reflections building links between
    - theory provided in lectures and practice obtained in projects
    - their projects and industrial experience
  - Provide funny and extreme examples with cash flow – show the benefit of these processes
  - Interesting idea would be that students exchange projects between the groups and try to continue development
  - Object oriented course should be before Software Eng.

# *Telecommunication Software Development* @FER

- 1st year (2nd semester) graduate
- Aim of the course:
  - Specialisation knowledge on software product lifecycle processes and software development models.
- Course design:
  - 30 lecturing + 12 hour of laboratory work in 12 weeks period.
- Students:
  - On average 40 students attend
  - All are full time students and without previous expertise working in software development

# Telecommunication Software Development @FER

- Highly structured approach
- Students worked in the group (2 students).
- Reorganized order of lectures: started with the importance of business idea instead of classical lessons about SRAM processes
  - Student project assignment (2 approaches predefined and free project)
  - Documentation – based on RUP
  - Software specification and Requirements management tools
    - introspection, brainstorming, and literature analysis and rarely interviewing
    - IBM Rational Requisite Pro, IBM Rational Rose
- Examination:
  - written and oral exams

# *Telecommunication Software Development* @FER

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    - Software specification involving description of business idea technical aspects
  - Software specification and Requirements management tools
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# Telecommunication Software Development @FER

- **Recommendations**
- Specialisation course at higher years teaching SRAM is best practice for better understanding foundations
- Students are better motivated if they develop their own project idea, use and argument the use of their own tools
- Besides software development related topics, the students were taught about presenting their idea to investors, intellectual property, patents and possible software licensing models.
- Use of tehcnologies like RUP in SRAM is highly recommended but in specialiation courses

# Experiences

- Although fundamentals related to SRAM are studied at undergraduate level specialisation courses teaching SRAM in application domains are recommended
- Projects are good practice for teaching SRAM
- Approach to the project
  - Basic courses should be with minimum technology, well specified, in well set up environments, followed with number of examples
  - Specialisation courses shoud provide freadom to choose, engage research approach

# Conclusion

- Key for effective student learning are innovative learning strategies based on
  - student creativity,
  - frequent reflections from teacher and other students
  - Working in teams and
  - engaging communication and frequent discussion.
- We belive that Software requirements and architecture modeling (SRAM) is a complex area and should be adequately implemented within study programme.
  - Firstly, at undergraduate level, after all programming courses the foundations of SRAM should be established.
  - On higher educational levels this fundamentals have to be extended with techniques and principles aligned to business needs.

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# Questions?