

Course Program

TFRG55 Requirements Engineering for Digital Systems

<http://cs.lth.se/krav>

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The objective of the course is to give basic and advanced knowledge and skills within requirements engineering for large-scale development of systems completely or partly based on software. The course gives both theoretical knowledge and practical skills in methods and techniques for requirements engineering. The course gives training in scientific paper reading.

1 Learning Objectives

1.1 Knowledge and understanding

For a passing grade the student must

1. be able to define basic concepts and principles within requirements engineering
2. give an account of several different types of requirements
3. be able to describe and value several different methods and techniques for requirements engineering
4. be able to describe and relate different sub-processes within requirements engineering
5. be able to describe the relation between the requirements engineering process and other processes in the product lifecycle

1.2 Skills and abilities

For a passing grade the student must

1. be able to choose suitable requirements techniques for a given context

2. be able to apply several different techniques for requirements elicitation
3. be able to apply several different techniques for requirements specification
4. be able to apply several different techniques for requirements validation
5. be able to apply several different techniques for requirements prioritisation

1.3 Judgement and approach

For a passing grade the student must

1. be able to consciously select a process depending on the nature of the requirements
2. show a systematic and long-term approach to processes
3. be able to consciously see the problem in the relation between the quality of requirements and the quality of the resulting implementation
4. be able to adequately involve users in the requirements engineering process

2 Contents

The course includes theory and practice regarding the following topics:

1. Requirements on different abstraction levels and in different contexts
2. Sub-processes of requirements engineering and their relation
3. Specification of data requirements, e.g. using virtual windows and data models
4. Specification of functional requirements, e.g. using textual feature requirements and task descriptions
5. Specification of different types of non-functional requirements, e.g. usability, performance, reliability
6. Different techniques for requirements elicitation
7. Different techniques for requirements validation
8. Different techniques for requirements prioritization

3 Course elements

L: Lectures The lectures provide an overview of the literature. They do not cover every detail, but give a high-level structure of the subject and thereby aid self-studies of the literature. Discussions are promoted.

E: Exercises The main objective of the exercises is to support the project and prepare for the written exam through prototypical problems, by connecting theory to practice and to give opportunity to discuss details of RE techniques.

LAB: Computer lab sessions The lab sessions illustrate computer supported prioritization and release planning, and demonstrates the complexity of requirements selection and scheduling. Preparations are mandatory.

P: Project The project involves performing practical requirements engineering for a given case, and is performed individually. The project involves a number of deliverables.

4 Assessment

- The project is graded fail/3/4/5 based on project deliverables.
- Approved lab session preparations and assignments are required for passing.
- The written exam comprises two parts: a multiple-choice part and a part with essay and practical assignments. 50 percent is required for each part for passing. The essay and practical assignment part yields max 100 points and determines the grade 3-4-5.
- The final course grade on the scale fail/3/4/5 is based on the written exam points (from essay and practical assignment) and the project grade using the following mapping:

| | Project: 3 | Project: 4 | Project: 5 |
|----------|-------------|------------|------------|
| | Exam points | | |
| Final: 3 | ≥ 50 | ≥ 50 | ≥ 50 |
| Final: 4 | ≥ 75 | ≥ 67 | ≥ 60 |
| Final: 5 | ≥ 90 | ≥ 83 | ≥ 75 |

5 Literature

The course elements and the written exam will cover the following literature:

| | |
|--------|---|
| Lau | Soren Lauesen, Software Requirements - Styles and Techniques, Addison-Wesley, ISBN 0-201-74570-4, 2002. |
| LAB1&2 | Preparations and instructions for Lab 1: "Requirements Modeling" and Lab 2: "Requirements Prioritization and Release Planning" |
| PRIO | "Requirements Prioritization", Patrik Berander and Anneliese Andrews, Engineering and Managing Software Requirements, Eds. A. Aurum and C. Wohlin, Springer, ISBN 3-540-25043-3, 2005 |
| QUPER | Supporting Roadmapping of Quality Requirements - B Regnell, Richard Berntsson Svensson, Thomas Olsson, IEEE Software 25(2) pp 42-47 March-April 2008 |
| PROTO | "A Model of Software Prototyping based on a Systematic Map", Bjarnason, E., Lang, F., Mjoberg, A.: International Symposium on Empirical Software Engineering and Measurement (ESEM), pp. 1-11. 2021 |
| INSP | "Att inspektera krav". Sid 67-76, Framgångsrik kravhantering, andra utgåvan, Teknikföretagen, Joachim Karlsson, V040072, ISSN 1103-7008, 1998 |
| AGRE | "Agile Requirements Engineering Practices: An Empirical Study", Lan Cao, Balasubramaniam Ramesh, IEEE Software , January/February 2008, pp.60-67, 2008 |

6 Overview

| | <i>Topic</i> | <i>Literature</i> | <i>When</i> |
|------------|---|-------------------------|-----------------------------|
| W1 | L1 Introduction BR | Lau:1 | Tue 15-17 |
| | L2 Project kick-off, Elicit, Prio BR | Lau:8, PRIO | Wed 13-15 |
| | E1 Requirements types, Context diagram | Lau:1 | Thu 10-12 or 13-15 |
| W2 | L3 Specification 1, reqT BR | Lau: 2-4 | Tue 15-17 |
| | L4 Specification 2 BR | | Wed 13-15 |
| | P Project Mission: hand-in | | Tue 23.59 |
| | E2 Elicitation | Lau: 8 | Thu 10-12 or 13-15 |
| | Lab1 Reqs Modelling, Prio | LAB1 | We 15-17, Fr 10-12 or 15-17 |
| | P Supervision meeting | | |
| W3 | L5 Prototyping EB, Rel plan BR, | RP | Tue 15-17 |
| | L6 Product mgmt, Market-driven + Open Source RE, Interdependencies Guest: Johan Linåker | MDRE, OSSRE, INTDEP | Wed 13-15 |
| | E3 Functional requirements | Lau:2-4 | Thu 10-12 or 13-15 |
| | P Release R1: hand-in | | Deadline Sun 23.59 |
| W4 | P Supervision meeting | | |
| | L7 Specification 3, Quality, Lifecycle | Lau:5-7, QUPER | Tu 15-17 |
| | E4 Quality requirements | Lau:6, QUPER | Thu 10-12 or 13-15 |
| | Lab2 Prioritization, Release Planning | LAB2 | We 15-17, Fr 10-12 or 15-17 |
| W5 | L8 Validation, Inspections, Agile RE EB | Lau:9, INSP, AGRE, ATCR | Tue 15-17 |
| | E5 Validation | Lau:9, INSP | Thu 10-12 or 13-15 |
| | P Release R2: hand-in and send to validation group | | Deadline Sun 23.59 |
| | P Validation Checklist: hand-in and to validation group | | Deadline Sun 23.59 |
| W6 | P Supervision meeting | | |
| | P Validation Report: hand-in and to authoring group | | Deadline Thu 23.59 |
| W7 | P Release R3: hand-in | | Deadline Sun 23:59 |
| Mar | Exam | All literature | March 18, Fr 8-13 |
| | P Course Evaluation -> BR EB, 1 per project | | March 25, Fr 23.59 |

NOTE: Lecture L6 is optional for TFRG55.

7 Personnel

Bjorn.Regnell BR
 Elizabeth.Bjarnason EB
 Johan.Linaker JL
 Sergio.Rico SR
 TBD
 Ulrika Templing
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Coordinator, Lectures, Exam
 Coordinator, Lecture, Exercises, Exam
 Lecture
 Project and lab supervision
 Project and lab supervision
 Course Secretary

8 Rooms

| <i>What</i> | <i>Where</i> |
|-------------|--------------------------|
| Lectures | E:C, for all but L2 E:A |
| Exercises | E:1124. For E5 in E:1145 |
| LAB | E:Val |
| Exam | MA 9A, 9B |