

# **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. The release planning part is optional.

**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 fail | 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

PROTO1 "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). 2021

PROTO2 "Prototyping practices in software startups: Initial case study results", Bjarnason, E., IEEE 29th International Requirements Engineering Conference Workshops (REW). 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

See what lecture L1-L8 is connected to which literature item on the next page.

## 6 Overview

		<i>Topic</i>	<i>Literature</i>	<i>When</i>
<b>W1</b>	L1	Introduction	Lau:1	Tue 15-17
	L2	Project kick-off, Elicit, Prio	Lau:8, PRIO	Wed 15-17
	E1	Requirements types, Context diagram	Lau:1	Thu 10-12 or 13-15
<b>W2</b>	L3	Specification 1, reqT	Lau: 2-4	Tue 15-17
	L4	Specification 2		Wed 15-17
	P	Project Mission		Tue 23.59
	E2	Elicitation	Lau: 8	Thu 10-12 or 13-15
	Lab1	Reqs Modelling, Prio	LAB1	Wed 15 or Fr 10 or Fr 13
	P	Supervision meeting		
<b>W3</b>	L5	Agile RE, video	AGRE, PROTO1-2,	Tue 15-17
	*L6	Product mgmt, Release planning, guest	MDRE, RP, OSSRE, INTDEP	Wed 15-17
	E3	Functional reqts, Prototyping	Lau:2-4	Thu 10-12 or 13-15
	P	Release R1		Deadline Sun 23.59
<b>W4</b>	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	Wed 15 or Fr 10 or Fr 13
<b>W5</b>	L8	Validation, discuss L5, exam prep	Lau:9, INSP	Tue 15-17
	E5	Validation	Lau:9, INSP	Thu 10-12 or 13-15
	P	Release R2		Deadline Sun 23.59
	P	Validation Checklist		Deadline Sun 23.59
		<i>send to validation group</i>		
<b>W6</b>	P	Validation Report		Deadline Thu 23.59
		<i>send to authoring group</i>		
<b>W7</b>	P	Supervision meeting		Mon 13
	P	Release R3		Deadline Sun 23:59
<b>Mar</b>	Exam		All literature	March 17, 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	Coordinator, Lectures, Exam
Elizabeth.Bjarnason	EB	Coordinator, Lecture L8, Exercises, Exam
Johan.Linaker	JL	Lecture L6
Sergio.Rico	SR	Project and lab
Ulrika.Templing		Course admin
Birger.Swahn		Course admin
...all e-mails @cs.lth.se		
Linnea Allander	LA	Project and lab
li6687al-s@student.lu.se		

## 8 Where is the teaching?

Preliminary room allocation – double-check in TimeEdit for late changes:

<i>What</i>	<i>Where</i>
Lectures	E:C, except L5: pre-recorded video in Canvas
Exercises	E:1407, E:3318, E:3336
Labs	E:Varg
Exam	MA10DE