



L1 – Introduction

DAT232/DIT285 Advanced Requirements Engineering

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September 2, 2025

Introduction

Motivation

What is RE?

Why is RE
important?

Course setup

Learning Objectives

Course structure

Examination

Changes since last
year

Practical things

The project

Wrapping up



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Visit **gosocrative.com** and enter room name
REQENG



Lecture starts at 13:15

Learning objectives

What are key concepts and definitions of Requirements Engineering?

Which activities does Reqts. Eng. entail?

What value does Reqts. Eng. provide?

Introduction

Motivation

What is RE?

Why is RE important?

Course setup

Learning Objectives

Course structure

Examination

Changes since last year

Practical things

The project

Wrapping up



UNIVERSITY OF
GOTHENBURG



CHALMERS
UNIVERSITY OF TECHNOLOGY

1 Introduction

Motivation

What is RE?

Why is RE important?

2 Course setup

Learning Objectives

Course structure

Examination

Changes since last year

Practical things

3 The project

4 Wrapping up



Meet the team

Eric Knauss	Hina Saeeda	Nayat Saryano	Osama Ateeq	Jakob Lund Persson
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Eric is a Professor in Software Engineering with a passion for requirements engineering, agile methods at scale, and the engineering of complex software-intense systems. He has more than 100 peer-reviewed publications and is a reviewer for top venues and journals in these areas. He holds a PhD from Leibniz Universität Hannover, Germany and was a postdoctoral fellow at University of Victoria, BC, Canada before joining Chalmers and Göteborg Universitet in 2013.	Lilia Beniaminova	Lin Qiqi	Suvrangshu Barua	Becky Bergman
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Acknowledgements

In creation of the course material, I was inspired by many researchers, teachers, and practitioners. This has lead to my structuring of this course, the examples that I include, and sometimes even the very material. It is my ambition to reference all of these instances to their origin.

With respect to the overall structure and content, I should mention the following key influences:

- Dr. Richard Berntsson Svensson, Chalmers | University of Gothenburg, Sweden, who was himself inspired by Prof. Björn Regnell, Lund University and Prof. Tony Gorschek, Technical University of Blekinge.
- Prof. Kurt Schneider, Leibniz Universität Hannover, who was himself inspired by his work at Daimler and Prof. Martin Glinz, University of Zurich.
- Prof. Daniela Damian, University of Victoria, who has challenged my view on requirements engineering in the most positive way.

You will soon be working as an
engineer...

- What is software engineering?



You will soon be working as an engineer...

- What is software engineering?
 - How different from computer science?





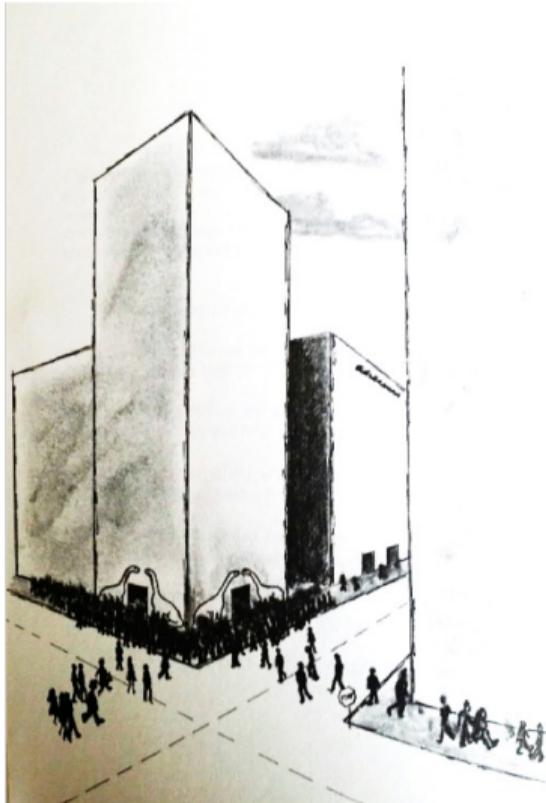
You will soon be working as an engineer...

- What is software engineering?
 - How different from computer science?
- What is requirements engineering?





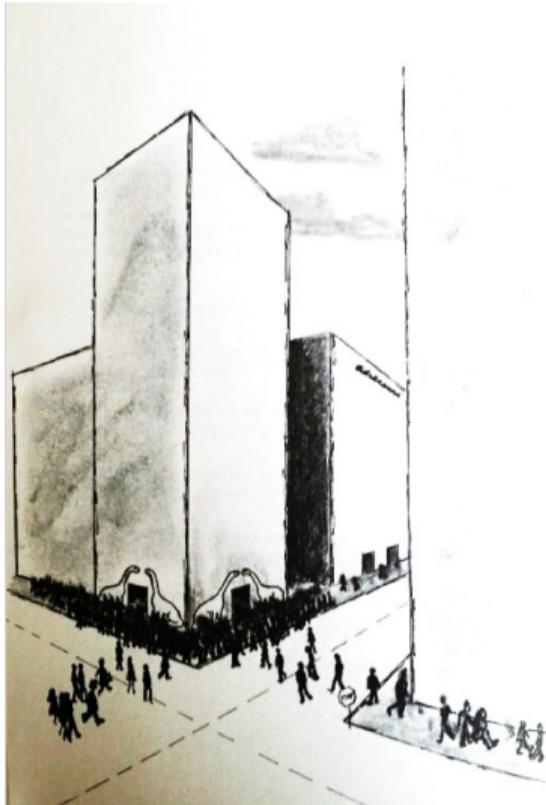
A Problem



At the heart of Gotham City's financial district stands the glistening new 73-story Brontosaurus Tower.^a

- Even though not yet fully occupied, the elevator service has been found woefully inadequate
- Some tenants have actually threatened to leave if the service is not improved, and quickly.

^aExample taken from [Gause and Weinberg, 1982]



A Problem – Facts

- ① Building primary houses offices
(hours: weekdays, 9am to 5pm)
- ② Nearly everyone using the building is associated in some way with the financial world
- ③ Occupants fairly uniformly distributed over the 73 floors – and so is the elevator traffic
- ④ The owner has invested heavily in advertising to fill the remaining office space.
- ⑤ Discouraging words spread like lightning in the tight little world of the financial district.

What is to be done about this situation?

→ socrative.com, Room REQENG

A Problem – Immediate Ideas

- 1 Speed up the elevator
- 2 Add elevators by cutting new shafts through the building
- 3 Add elevators by constructing outside shafts
- 4 Stagger working hours to spread the rush hour load over a longer period
- 5 Move occupants to different floors to reduce total passenger traffic within the building
- 6 Restrict the number of people entering the building
- 7 Replace existing elevators with bigger cars stretching two or three stories
- 8 Provide more services locally on each floor to reduce floor-to-floor traffic
- 9 Reschedule the elevators with special local and express arrangements, as needed

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Not so good: Rushed into solutions

Instead: Ask a few questions:
– Who has the problem?
– What is the problem?

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“The Landlord”

A Problem – Immediate Ideas

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- ⑧ Provide more services locally on each floor to reduce floor-to-floor traffic
- ⑨ Reschedule the elevators with special local and express arrangements, as nee

- ① Increase the rent, so fewer occupants will be needed to pay off the mortgage
- ② Convince the occupants that Brontosaurus Tower is a terrific leisurely place to work because of the elevator situation
- ③ Convince the occupants that they need more exercise – which they could get by walking the stairs – by posting walking times and calorie consumption estimates over well-traveled routes
- ④ Burn down the building and collect the fire insurance
- ⑤ Sue the builder
- ⑥ Steal elevator time from the next-door neighbor

Not so good: Rushed into solutions

“The User”

Instead: Ask a few questions:
– Who has the problem?
– What is the problem?

“The Landlord”

A Problem

is a difference between things as **desired** and things as **perceived**.



A Problem

is a difference between things as **desired** and things as **perceived**.

A Requirement

is a condition or capability **needed** by a user to solve a **problem** or achieve an objective.



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is a difference between things as **desired** and things as **perceived**.

A Requirement

is a condition or capability **needed** by a user to solve a **problem** or achieve an objective.

Requirements Engineering

is a systematic approach to reduce the likelihood to develop the wrong solution (i.e., one that does not solve the problem).





Without requirements no business

They will change—but we know that!
They are our capital / resource

A positive viewpoint

What is Requirements Engineering?

Vague and visionary requirements

Okay in the beginning, but must be refined over time!

Definition

most commonly used

A requirement is [IEEE, 1990]:

- ① A condition or capability **needed** by a user to solve a problem or achieve an objective.
- ② A condition or capability that **must** be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed document.
- ③ A documented **representation** of a condition or capability as in (1) or (2).

→ socrative.com, Room: REQENG, Question 2

Discuss to activate prior knowledge

Introduction

Motivation

What is RE?

Why is RE
important?

Course setup

Learning Objectives

Course structure

Examination

Changes since last
year

Practical things

The project

Wrapping up

- What was realistic or unrealistic with the requirements engineering you did in previous project courses?
- What different types of requirements did you encounter?



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Basic terminology

What is Requirements Engineering?

Lauesen: “A requirement specification is a document that describes what the system should do.”

- What is “what” and what is “how”?
- Always a “document”?
- What is “the system”?
- How much about the domain?



Different contexts and project types

What is Requirements Engineering?

- In-house
- Product Development
- Time & Materials
- Commercial Off-The-Shelf software (COTS)
- Customization
- Tender
 - Customer specific
 - Generic (COTS)
- Contract development
- Sub-contracting
- Unknown, pre-study
- Hybrid

The context is critical to the requirements engineering!



Project types

Based on [Lauesen, 2002].

<i>Project types</i>	Customer	Supplier
In-house	User dept.	IT dept.
Prod. dev.	Marketing	SW dev.
Time and materials	Company	SW house
COTS	Company	(Vendor)
Tender	Company	Supplier
Contract dev.	Company	SW house
Sub-contracting	Supplier	SW house
Unknown		In-house? COTS?



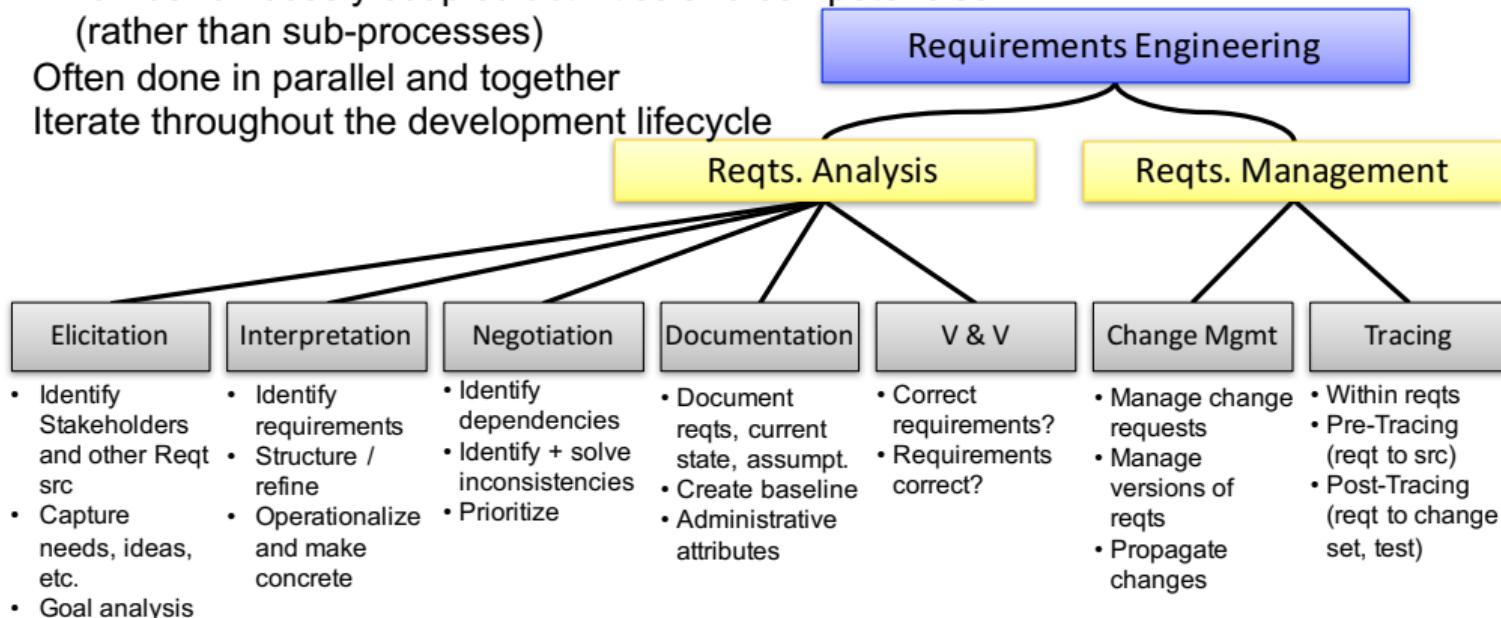
Activities

What is Requirements Engineering?

A number of loosely coupled activities and competencies
(rather than sub-processes)

Often done in parallel and together

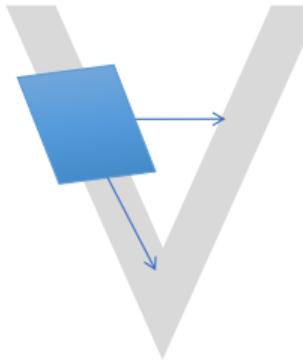
Iterate throughout the development lifecycle



Src: DaimlerChrysler, Dagstuhl-Seminar 1998

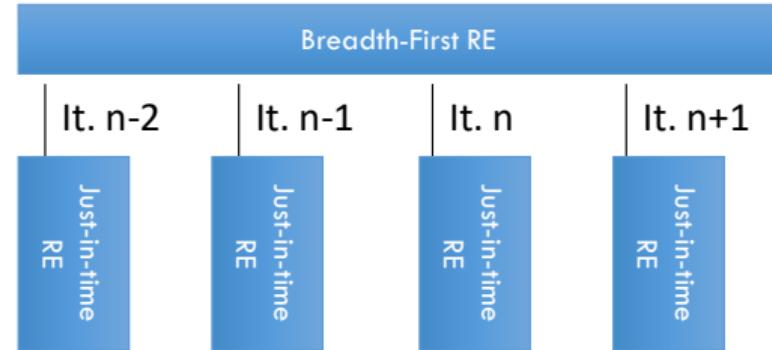
Requirements Engineering: Organizational aspects

Then



Requirements a “waterfall phase”
with specialists

Now



Requirements are everybody's
responsibility

A knowledge management problem

“Individuals and interactions [...] over
comprehensive documentation”

Why is requirements engineering important?

Introduction

Motivation

What is RE?

Why is RE
important?

Course setup

Learning Objectives

Course structure

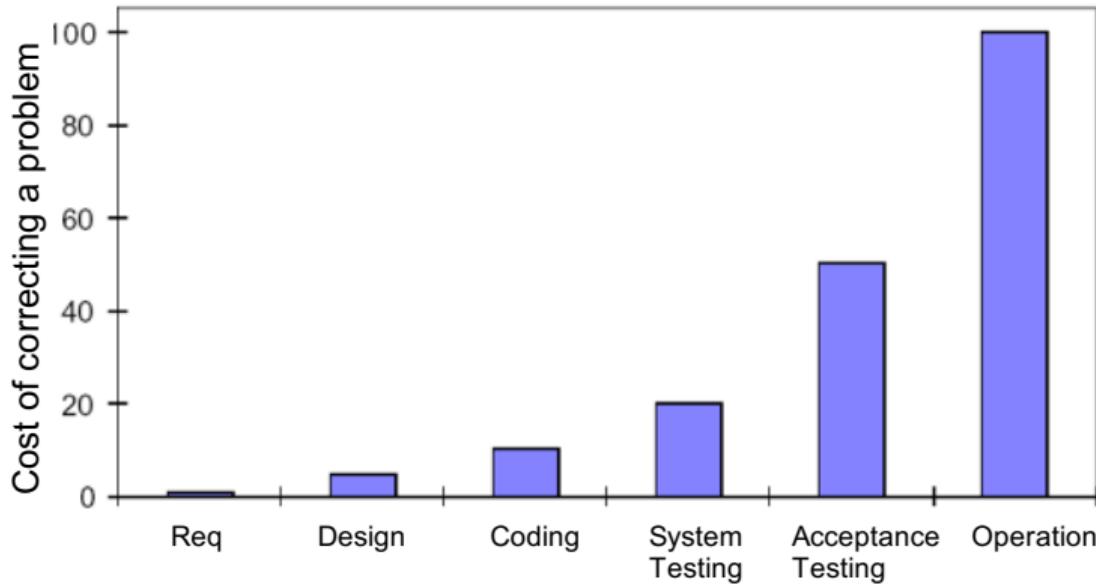
Examination

Changes since last
year

Practical things

The project

Wrapping up



[Davis, 1993]



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1 Introduction

Motivation

What is RE?

Why is RE important?

2 Course setup

Learning Objectives

Course structure

Examination

Changes since last year

Practical things

3 The project

4 Wrapping up





Course content

Requirements Analysis

- **Elicitation** Identify Stakeholders and Requirements
- **Interpretation** Model requirements and relate them to each other.
- **Documentation** Writing Requirements and Requirements Specifications
- **Negotiation** Prioritization and Conflict resolution
- **Verification and Validation** Quality Assurance of Requirements

For each:

- What is it?
- Why is it important?
- Why is it hard to do?
- How to approach it in principle?
- Concrete practices?
- How does the context matter?

Requirements Management

- **Change Management** Keep requirements consistent and up to date
- **Traceability** Connections and Alignment between requirements and to other SW artifacts

Introduction

Motivation

What is RE?

Why is RE
important?

Course setup

Learning Objectives

Course structure

Examination

Changes since last
year

Practical things

The project

Wrapping up



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Learning Objectives



Knowledge

Identify a common RE challenge in a given software development context.



Skills

Plan suitable RE practices in a team with respect to a given software development context.



Judgement

Assess new requirements engineering knowledge (challenge, principle, practice) and relate them to the framework in this course.

Choose an appropriate RE practice in a given software development context.

Effectively apply a suitable RE practice in a team in a given software development context.

Suggest suitable actions to overcome a lack of requirements knowledge in a software development context.

Compare suitability as well as advantages and disadvantages of given RE practices in a given software development context.

Analyze the effect and quality of the outcome of a set of or individual RE practices in a given software development context.

Consider inter-team, program level and social/ethical implications of a set of RE practices in a given software development context.

Explain the current state of practice and research in requirements engineering.

Critically assess the effectiveness of a set of RE practices from the perspective of the student's master program (e.g. Software Engineering & Technology/Management, Interaction Design, Game Design, Data Science, ...)

Course structure

Introduction

Motivation

What is RE?

Why is RE important?

Course setup

Learning Objectives

Course structure

Examination

Changes since last year

Practical things

The project

Wrapping up



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- 10 lectures
 - Give overview and structure (not all theory is covered)
- 3-4 workshops (incl. project info WS) MANDATORY
 - How to use theory in the project, prepare for exam
- Project (3.5 credits \approx 80h per person, 4-5 persons, total budget \approx 320-400h)
 - Purpose: to apply theory in practical work
 - You act as requirements engineers from a customer perspective
- Digital hall exam on lectures/literature (4 credits)
 - Written exam on all literature (4 credits)
 - Literature: Lauesen + research papers



Examination

Three components:

- ① Project grade, base grade per group with option for individual adjustment (Fail, 3, 4, 5)
- ② Workshops (Fail, Pass); graded individually
- ③ Digital hall exam, individual (Fail, 3, 4, 5)

Digital hall exam

	Points	Grade
0%	< 40	F
50%	≥ 40	3
70%	≥ 56	4
85%	≥ 68	5

Final course grade

- Fail: Missed getting a passing grade on one or more of the three components
- Pass: Grade based on average of project and exam grade
 - $\text{ROUND}((\text{projectgrade} * 3.5 + \text{examgrade} * 4) / 7.5)$

Changes since last year

Introduction

Motivation

What is RE?

Why is RE
important?

Course setup

Learning Objectives

Course structure

Examination

Changes since last
year

Practical things

The project

Wrapping up

- Scaled up course design
 - 2025: plan for 175; expect 125
 - 2024: plan for 120; 168 registered
 - \leq 2023: 96
- Move from take-home exam to digital hall-exam
- Redesign of workshops to scale (ongoing)
- Increase fairness in grading: Normalize weight of project and exam grade by credits in module



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Practical things

- Register for the course and make sure that you can receive (email) messages via Canvas!
- Project groups randomly created based on survey
<https://forms.office.com/e/jWYRGHHXOX>
- Course homepage on Canvas, Gitlab as working environment (and backup).
 - <https://canvas.chalmers.se/courses/36076>
 - <https://git.chalmers.se/courses/dat231>
- ICC course



Note to self: Show Canvas



CID for GU students

- ① Go to
<https://git.chalmers.se/courses/dat231>
- ② Login with your CID
- ③ Search for your project (once assigned), request to be added as a member
- ④ Add other team members, if you can

Go to <https://myaccount.chalmers.se/> and login with your account from Antagning.se / Universityadmissions.se – you will see your Chalmers account (CID), and you can choose a Chalmers password, and a PIN code for door keycard access.

The MyAccount web portal is still under development, so if you have problems:

- Please wait a little while and try again.
- Try using another computer or phone, or another web browser.
- Try "private browsing", or clear your web browser cookies and cache.

If you still have problems after trying the steps above, please contact Chalmers IT Support at "support@chalmers.se" or phone +46317726500. Or you could visit our IT Helpdesk and get a password there (bring valid ID or passport):

<https://student.portal.chalmers.se/sv/kontaktochservice/it-passerkort-kopiering/Sidor/IT-support.aspx>

1 Introduction

Motivation

What is RE?

Why is RE important?

2 Course setup

Learning Objectives

Course structure

Examination

Changes since last year

Practical things

3 The project

4 Wrapping up

Introduction

Motivation

What is RE?

Why is RE
important?

Course setup

Learning Objectives

Course structure

Examination

Changes since last
year

Practical things

The project

Wrapping up

First steps

The project starts now!

- Groups randomly assigned after first lecture
- Meet in your group and align on project mission
- Contact your supervisor in case of any questions



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Project objectives

- Connect theory to practice
- Provide concrete experience of practical RE
- Have real stakeholders
- Provide realistic problems

Context and Roles

Three main tasks:

- Write a specification from customer perspective in 3 iterations
- Reflect on experiences during these 3 iterations
- Review specifications from other groups

Project team:

- Randomly assigned

The project

General rules

- 80h per person
- Mainly customer work, but also peer-reviews of other groups' specifications
- Meet your group supervisor: As often as needed, at least in Course Week 2, 4, and 6



Tasks

As a customer:

- Align on project mission
- Do real elicitation, i.e. go out and interview potential users
- Write a specification in 3 iterations

As a reviewer:

- Plan the review of another group's specification within your group
- Review specification(s)
- Integrate findings into a joint review report

As a student:

- Engage in effective group work
- Reflect on experiences
- Document and present experiences

Releases and deliverables

Introduction

Motivation

What is RE?

Why is RE important?

Course setup

Learning Objectives

Course structure

Examination

Changes since last year

Practical things

The project

Wrapping up



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- 3 iterative releases
- Each release > previous release
- Each release:
 - Requirements Document
 - Project Experience Report
 - Team agreement
 - Individual Contribution Assessment (per group member)
- For R2, R3:
 - Change history
 - Indication of how grading criteria was addressed



Project deadlines

Releases and deliverables

Phase	Deliverable	Deadline
Definition	Project mission	Week 1: Friday 1pm
Iteration 1	Release 1	Week 4: Monday 8am
	Review R1	Week 4: Friday 4pm
Iteration 2	Release 2	Week 6: Monday 8am
	Review	Week 6: Friday 8am
Iteration 3	Conference presentation	Week 8: Monday 4pm
	Release 3	Week 9: Monday 8am

Each deliverable: In PDF via Canvas
(Conference Presentation also as PPT/PPTX)

A “Good” Project mission

- You have a deep knowledge of the domain
- You have a genuine interest in the system
- It is feasible to collect requirements from different sources. Examples:
 - Interview potential users at Nordstan,
 - Read app reviews of related apps,
 - Analyze advertisements of potential competitors,
 - Send surveys, ...
→ Elicitation Lecture this week, Friday, 13:15
- The mission has a business case
- Ideally, the mission has interesting possibilities



1 Introduction

Motivation

What is RE?

Why is RE important?

2 Course setup

Learning Objectives

Course structure

Examination

Changes since last year

Practical things

3 The project

4 Wrapping up



Learning objectives

What are key concepts and definitions of Requirements Engineering?

- Requirement
- Requirements Engineering
- Requirements Specification

Which activities does Reqs. Eng. entail?

- Analysis (Elicitation, Interpretation, Negotiation, Documentation, Verification&Validation)
- Management (Traceability, Change Management)
- Not in a particular order!

What value does Reqs. Eng. provide?

- Systematic/shared understanding of problem
- (potential to find problems early)
- Foundation for project management, design decisions, development, testing, contracts, maintenance

- Register to the course (via Student office) and fill out survey (required to be assigned to group)!
<https://forms.office.com/e/jWYRGHHXOX>.
- Make sure you are on Canvas and that you receive notifications!
- Meet in groups as soon as they are assigned (today or tomorrow, check Canvas)

Wrapping up What now?





Wrapping up

Additional notes 1(2)

- How much should you write?
 - For Project Mission, 1 page!
 - For Experience reports, stated in project description as MAX limit
 - All other deliverables, check for page limits (see project description)
- Plagiarism (= unattributed copying of material from other sources) will
 - Yield an immediate FAIL on course
 - Be reported to university disciplinary board
- Use of generative AI and similar: Disclose how it has been used.
 - You are always responsible for content that you or your group has generated and must be able to defend it

Wrapping up

Additional notes 2(2)

- Student participation

- You are expected to take responsibility
- Lectures focus on the course literature, but will not cover everything. Additional information will also be covered during the lectures
 - Read book and research papers early and beforehand
- Active participation
- Discuss!!!
- Reflect and relate to experiences



Wrapping up

[Homepage](#)

- Check at least twice a week!
- Make sure that Canvas notifications work
 - <https://canvas.chalmers.se/courses/36076>
 - <https://git.chalmers.se/courses/dat231>



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Introduction

Motivation

What is RE?

Why is RE
important?

Course setup

Learning Objectives

Course structure

Examination

Changes since last
year

Practical things

The project

Wrapping up

Read the Literature!!!



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Introduction

Motivation

What is RE?

Why is RE
important?

Course setup

Learning Objectives

Course structure

Examination

Changes since last
year

Practical things

The project

Wrapping up



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Go to Workshops!!!

Wrapping up

Todo

- Theory: Get familiar with course literature
 - On the timeline, [Lau] refers to [Lauesen, 2002], the course book
 - Read [Lau:1], i.e. Chapter 1 in [Lauesen, 2002] to complement today's lecture
 - Read [Lau:8] to prepare for L2 on Thursday
- Attend Lecture L2-Elicitation on Thursday
- Attend ICC Lecture on Friday
- Attend Project workshop on Tuesday (after L3-Documentation)
- Read the project description on Canvas
- Meet with your project group and get going as soon as possible (consider supervised group time on Thursday)
- Project Mission must be received this week Friday at 13:00
- Book time via email with project supervisor W2, W4, W6 *and whenever needed!* (Each group has a project supervisor)

Introduction

Motivation
What is RE?
Why is RE important?

Course setup

Learning Objectives
Course structure
Examination
Changes since last year
Practical things

The project

Wrapping up



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Cockburn, A. (2001).
Writing Effective Use Cases.
Addison-Wesley.



Davis, A. M. (1993).
Software Requirements: Objects, Functions and States.
Prentice Hall.



Gause and Weinberg (1982).
Are your lights on?
Dorset House Publ.



Gorschek, T. and Wohlin, C. (2006).
Requirements abstraction model.
Requirements Engineering, 11:79–101.



IEEE (1990).
IEEE standard glossary of software engineering terminology.
IEEE Std 610.12-1990, pages 1–84.



Lauesen, S. (2002).
Software Requirements.
Pearson / Addison-Wesley.
the course book (Lau).