Requirements Engineering

Course Summary
# Course outline

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Lecture 1: Introduction

Where are the challenges?

Application Domain

Machine Domain

specification

programs

computers
Lecture 1: RE framework

System context
- Subject facet
- Usage facet
- IT system facet
- Development facet

Core activities
- Documentation
- Elicitation
- Negotiation

Requirements artefacts
- Goals
- Scenarios
- Solution oriented requirements

Validation

Management
Lecture 2: Elicitation Techniques

- **Traditional techniques**
  - Reading existing documents
  - Analyzing hard data
  - Interviews
    - Open-ended
    - Structured
  - Surveys / Questionnaires
  - Meetings

- **Collaborative techniques**
  - Focus Groups
    - Brainstorming
    - JAD/RAD workshops
  - Prototyping
  - Participatory Design

- **Contextual (social) approaches**
  - Ethnographic techniques
    - Participant Observation
    - Ethnomethodology
  - Discourse Analysis
    - Conversation Analysis
    - Speech Act Analysis
  - Sociotechnical Methods
    - Soft Systems Analysis

- **Cognitive techniques**
  - Task analysis
  - Protocol analysis
  - Knowledge Acquisition Techniques
    - Card Sorting
    - Laddering
    - Repertory Grids
    - Proximity Scaling Techniques
# Lecture 2: Specification / Documentation

## 1 Introduction
- **Purpose**
- **Scope**
- Definitions, acronyms, abbreviations
- Reference documents
- **Overview**

## 2 Overall Description
- **Product perspective**
- **Product functions**
- **User characteristics**
- **Constraints**
- Assumptions and Dependencies

## 3 Specific Requirements

## Appendices

## Index

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### Identifies the product, & application domain

### Describes contents and structure of the remainder of the SRS

### Describes all external interfaces: system, user, hardware, software; also operations and site adaptation, and hardware constraints

### Summary of major functions, e.g. use cases

### Anything that will limit the developer’s options (e.g. regulations, reliability, criticality, hardware limitations, parallelism, etc)

### All the requirements go in here (i.e. this is the body of the document). IEEE STD provides 8 different templates for this section
Lecture 3:
Requirements negotiation

• **The goal of negotiation**
  – Identify conflicts
  – Analyse the causes of each conflict
  – Resolve the conflicts by means of appropriate strategies
  – Document the conflict resolution and the rationale

• **Resolve conflicts at the goal level**
  – Goals document rationale of the solution-oriented requirements
  – Fundamental contradictions can be resolved before the stakeholders go into technical details (of the goals realisation)
Lecture 3:

Validation Goal

- Check whether the **outputs** of activities fulfill defined quality criteria
- Check whether the **inputs** of activities fulfill defined quality criteria
- Check whether the **execution of activities** adheres to process definitions and activity guidelines
Lecture 5:  
Requirements prioritisation

- **Calculate return on investment**
  - Assess each requirement’s importance to the project as a whole
  - Assess the relative cost of each requirement
  - Compute the cost-value trade-off:
Lecture 7: Change Management

- **Product (artefact) dimension**
  - Concrete goals, scenarios, and solution-oriented requirements

- **Version dimension**
  - Manages different change states of the artefact of the product dimension
Lecture 8: NFR

- We have to turn our vague ideas about quality into measurables

The Quality Concepts (abstract notions of quality properties)

Measurable Quantities (define some metrics)

Counts taken from Design Representations (realization of the metrics)

examples...

- reliability: mean time to failure?
- complexity: information flow between modules?
- usability: time taken to learn how to use?

run it and count crashes per hour???

count procedure calls???
Lecture 8:
Goal Modelling

• **Relationships between goals:**
  - One goal **helps** achieve another (+)
  - One goal **hurts** achievement of another (-)
  - One goal **makes** another (++)
    - Achievement of goal A guarantees achievement of goal B
  - One goal **breaks** another (--)
    - Achievement of goal A prevents achievement of goal B

• **Goal Elaboration:**
  - “**Why**” questions explore higher goals (context)
  - “**How**” questions explore lower goals (operations)
  - “**How else**” questions explore alternatives
Lecture 9: Scenario modelling

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- **Actors:**
- **Description:**
- **Trigger:**
- **Preconditions:** 1.
- **Postconditions:** 1.
- **Normal Flow:** 1.
- **Alternative Flows:**
- **Exceptions:**
- **Includes:**
- **Priority:**
- **Frequency of Use:**
- **Business Rules:**
- **Special Requirements:**
- **Assumptions:**
- **Notes and Issues:**

Diagram:
- Add new staff member
- Add new staff grade
- Change rate for the client
- Change grade for the staff member
- Calculate staff bonuses

Accountant
Lecture 12: Requirements Modelling

Entity: entrance door  Entity: glass break detector

Data model  Behavioural model  Transition diagram

Requirement (natural language)

If a glass break detector attached to the entrance door detects that the entrance door has been damaged, the system shall enter the alarm state and inform the security company.

Functional model

Data flow diagram

Event: entrance door damaged
State: alarm state
Event: inform security company
Function: inform security company
Lecture 14: Validation – quality assessment

- **Physical** quality
- **Empirical** quality
- **Syntactic** quality
- **Semantic** quality
- **Pragmatic** quality
- **Perceived semantic** quality
- **Social** quality
- **Organisational** quality
Lecture 6 – Workshop 1
Lecture 10 – Workshop 2
Lecture 13 – Workshop 3
Lecture 15 – Workshop 4
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