

# Course analysis, Spring 2019

## II1305 Project in Information and Communication Technology

### Course Data

Examiner and coordinator: Fredrik Lundevall.

Teachers: Cicek Cavdar, Bengt Koren, Fredrik Lundevall, Anders Västberg.

Guest lectures by Simone Stefani and Phillip Gajland.

Course dates: Monday, 2018-03-18 through Monday, 2018-06-03.

Registered students: 57. Examined students: 57 (100%).

### General

The course is offered in year 2 for two programs: the Swedish-language Civilingenjörsutbildning i informationsteknik (CINTE), and the English-language Bachelor's Program in Information and Communication Technology (TCOMK). All written material for the course is in English.

The course teaches project methods and tools, and lets students with unconnected skills evolve into junior developers who can combine and extend their skills as needed. Students form teams of 5-8 persons. Each team conceives, designs, and implements a project with software, hardware, and/or communications technology. The course involves structured reflection, so that students process their experience into knowledge for the future. An outline is shown in Figure 1.

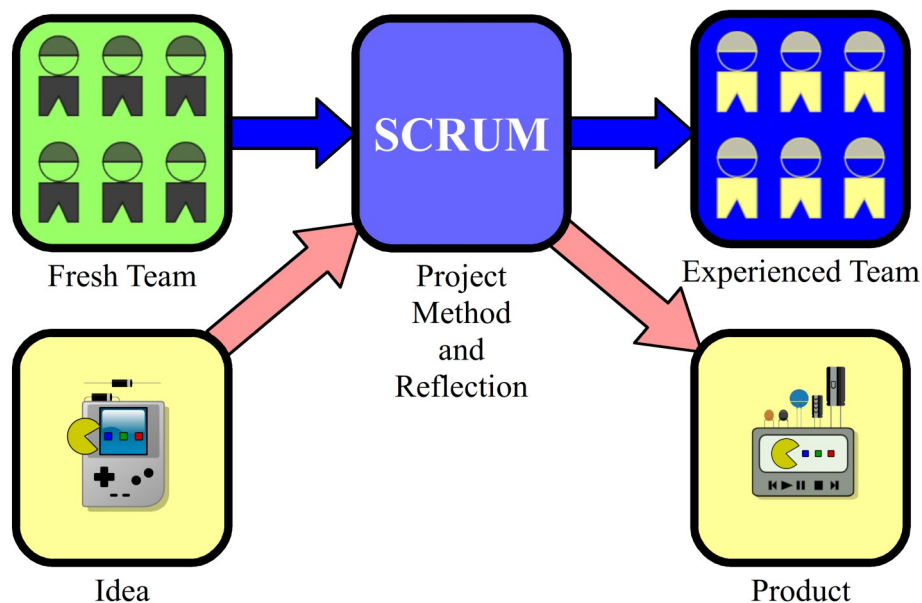


Figure 1. A very simplified outline of the course, in graphical form.

The course has three distinct phases: *preparation*, *project weeks*, and *reflection* (reflection is also a continuous part of the course). In the **preparation phase**, students form teams and read up on methods and tools (Scrum and Git). The teams discuss product ideas with a teacher, who must sign off on the product idea before the project begins. The preparation phase is shown in a simplified, graphical form in Figure 2.

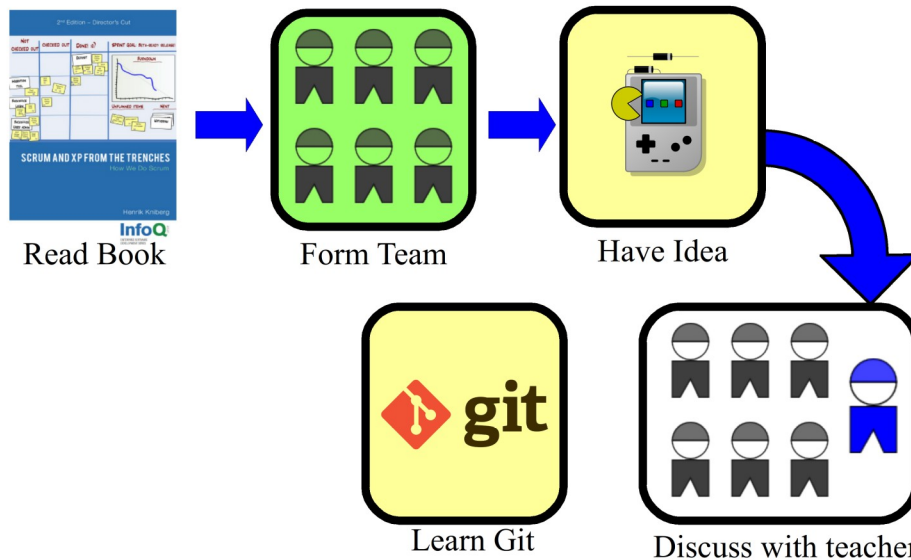


Figure 2. A simplified, graphical representation of the preparation phase of the course.

Teams are formed by the students, but the examiner has the last word on who goes in which team. As part of the preparation phase, all teams must create a so-called *social contract* for the team. The social contract contains rules of conduct for a productive collaboration.

A social contract is created by the following method. During a designated meeting, each team-member first writes down five rules of conduct, that are the most important ones for that team-member. After this part of the meeting, the teams reviews and discusses all rules suggested by all team-members, and agrees on five rules for the team as a whole.

Compared to the previous year, the importance of the social contract was emphasized in 2019. Furthermore, creating a social contract was made a mandatory assignment for all teams.

To ensure that all course participants know the most important methods and tools, quizzes in Canvas test specific parts of the book, or tools such as the Git version-control system. Students must finish all quizzes successfully during the preparation phase, before the project weeks.

Git is the version-control system used in the course. Three seminars on Git and testing are given by former students Simone Stefani and Phillip Gajland.

Each team is encouraged to invent a product idea, through brainstorming and other structured creative activities. Project-ideas from external stakeholders are welcome. Some students have contact with external stakeholders. In all cases, a teacher has the final word on which project idea should be implemented during the project weeks.

In the **project weeks**, teams work in four so-called sprints. Each sprint is one week long, and starts with a session of structured planning. The sprint ends with a demonstration, followed by a session of structured reflection.

The session of structured reflection is called a *sprint retrospective*. This is a one-hour meeting with structured discussion about the team's way of working during the sprint, focusing on possible improvements. The sprint-retrospective sessions need guidance from teachers, at least the first time.

During the sprints, students work weekdays from 08:00 through 17:00, with a one-hour lunch break. The specific working hours fulfill two purposes. Firstly, the method requires the team to be seated together, in the same room and at the same time. This ensures good communication within each project. Secondly, these working hours simulate actual developers' work-hours.

Each team has a designated workplace in a classroom. Two classrooms were booked for the course during the project week. Each classroom had workplaces for four teams. The passage-control system was set up to only allow course-participants access to the booked rooms.

To insure a productive co-existence of four different teams in the same room, team-spanning social contracts were set up for each room. In this case, each one of the four teams suggested five rules of conduct, after which all four teams agreed on a social contract for the room.

The social contract for the room is different from the social contract for the team. The room-wide social contract would contain rules of conduct regarding actions that could affect other teams; the team-wide social contract would contain rules of conduct that are important only within the team.

Using classrooms, with several teams in a room, is a change from the previous year. Previously, each team had one group-room each (in some cases, two rooms for a particularly large team). This change is discussed later, in the section "Analysis by the examiner".

The final phase of the course is the **reflection phase**. Immediately after the project-weeks, there is an expo, where all teams show their products to the general public. Following the expo, there is a week during which each student writes an individual reflection, to be handed in to the examiner.

To summarize, the course lets students perform real development work in a controlled environment. The three phases of preparation, project weeks, and reflection is part of a general pattern. The same pattern is repeated within each single project week: plan and try, demonstrate and then reflect. This pattern can be described as "**plan – try – reflect**". Reflecting on mistakes, and learning from them, is a very powerful learning activity, that is employed throughout the course.

## Students' view of the course

The students gave their view of the course mainly in two ways: through comments in their individual reflections, and through a learning experience questionnaire. There were also some oral comments during the project-weeks.

The **learning experience questionnaire** was open from 2019-05-29 through 2019-06-10. The questionnaire was filled-out by 14 out of 57 students – an answer rate of 25%.

In the questionnaire, most questions have the form of statements. For each statement, respondents indicate their degree of agreement on a scale of 1 through 7. There are also comment fields for each statement. Statements are worded so that a higher score indicates “better”.

Statements in the questionnaire fall into three categories: Meaningfulness (statements 1 through 6), Comprehensibility (7 through 16), and Manageability (17 through 22). The average response to the statements are shown in Figure 3.

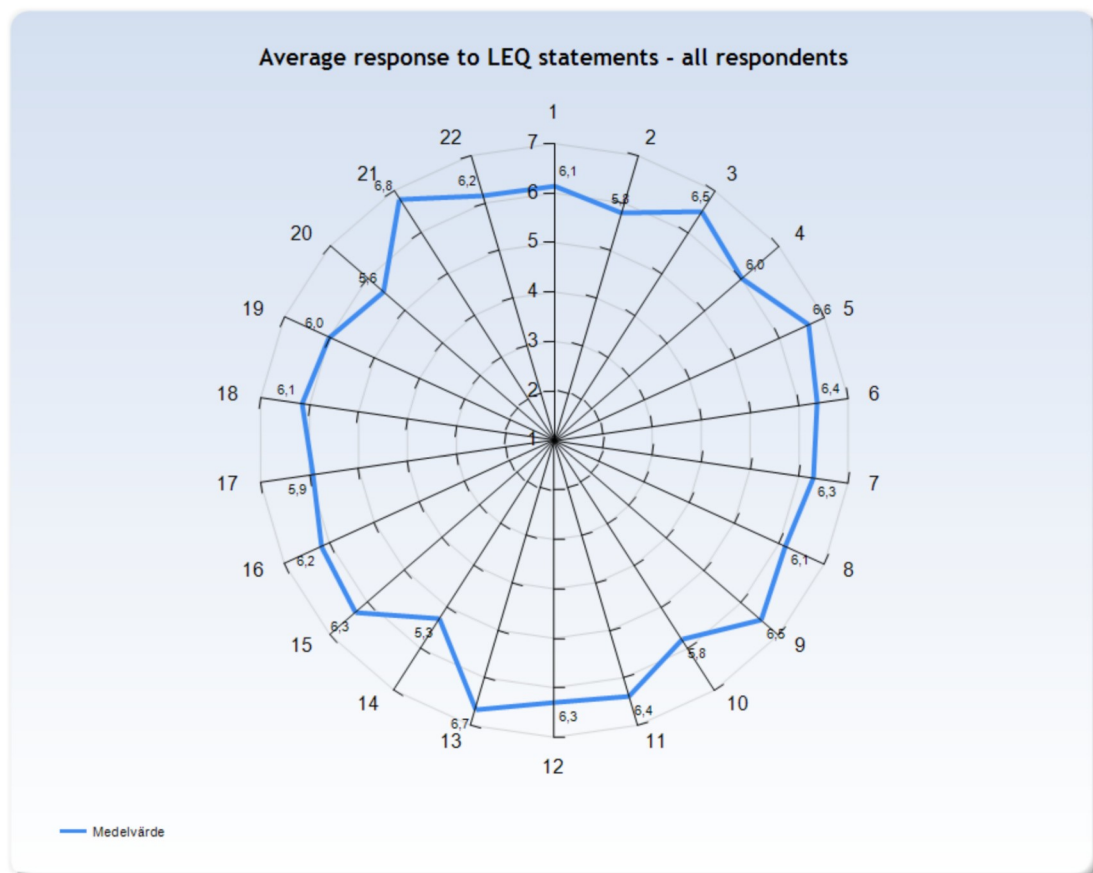


Figure 3. Average responses to learning experience questionnaire for II1305, 2019.

The respondents were very positive to the course. The Meaningfulness responses go from 5.8 to 6.6, indicating that students find the course highly relevant. The Comprehensibility and Manageability responses also have very high averages.

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A few questions in the questionnaire do not have statements to agree with (or disagree with). These questions include group membership, workload, gender, and type of student. There are also four general questions, with only comment-fields. These questions are: “What was the best aspect of the course?”, “What would you suggest to improve?”, “What advice would you like to give to future course participants?”, and “Is there anything else you would like to add?”.

One answer to “What was the best aspect of the course?” was: *“Since it's such a different course I'd say most of it! The whole concept is great for learning [...] development”*.

In response to the question “What would you suggest to improve?”, more than one suggestion discussed sick leave. Quote: *“That people stay home when they are sick. Perhaps let people stay home for 16 hours instead of just 8 before giving them extra work to do because no one wants to do the extra work so they go to school sick instead which makes everyone else sick.”*

When writing the **individual reflections**, many students added comments on the course. Students also gave oral comments during the course. These additional sources confirm the overall positive reception of the course, and also give additional suggestions for improvement.

Several comments in the individual reflections, and some in the learning experience questionnaire, concern the classrooms in Electrum. It was considered a problem that four teams shared a room. The comments state that the rooms were noisy because of discussions within other teams. Furthermore, the rooms were considered hot and smelly, particularly on sunny afternoons of May.

During the sprints, students work weekdays from 08:00 through 17:00, with a one-hour lunch break. Comments on this were both positive and negative. Some students commented that the schedule was hard to adjust to, but that the regular work-hours had benefits that became apparent later on.

Further comments in the individual reflections concerned the social contract, which was a mandatory task for all teams. The views on the social contract were positive, and comments sometimes included particulars on how having the social contract had helped to improve the working environment.

To summarize, the students are very positive to the course, and feel that they learn a lot during the course. As always, there is some room for improvement.

### **Analysis by the examiner**

II1305 is a mature course, evolved from earlier courses that were originally offered since 2005.

The greatest change in 2019 was to use two classrooms instead of many small group-rooms. In each classroom, four teams were seated in 2019. In 2018 (and earlier), each team had one group-room.

There were also more teacher-guidance at sprint-planning and sprint retrospectives.

The social contract was made a mandatory assignment for each team. Additionally, in each classroom all teams together had to set up a separate, room-wide social contract across the teams.

As part of an ongoing general revision of course plans, the admission requirements are updated starting from Spring, 2020.

The rest of this section is structured as follows. First, results from using a few large rooms instead of many small rooms are discussed. Following that, effects of more teacher-guidance and the mandatory social contract are discussed. Action points from 2018 are listed next, together with actions taken and summary comments on their effects. Course-plan changes and directions for the future are discussed last. Throughout the section, action-points for 2020 are introduced after discussion of possible options.

Considering *the rooms*, the course literature has general guidelines for the workplace of a team. The first and foremost guideline is: "Seat the team together!", expanded into three bullet-point requirements. The three requirements are quoted here, with clarifications by the examiner of II1305 shown in square brackets.

- *Audibility: Anybody in the team can talk to anybody else [in the team] without shouting or leaving his desk.*
- *Visibility: Everybody in the team can see everybody else [in the same team]. Everyone can see the task board [which shows tasks in progress, and other things; the task board is typically on a wall]. Not necessarily close enough to be able to read it, but at least see it.*
- *Isolation: If your whole team were to suddenly stand up and engage in a spontaneous and lively design discussion, there is nobody outside the team close enough to be disturbed. And vice versa.*

**Source:** Henrik Kniberg, *Scrum and CP from the Trenches – How We Do Scrum, 2nd Edition – Director's Cut* (InfoQ, 2015).

In the years 2005 through 2014, earlier courses similar to II1305 were offered in the Forum building. This building had group-rooms that could fulfill all three requirements, when used as team-rooms.

KTH moved out of the Forum building in 2014, concentrating all education in Kista to the Electrum building. The group-rooms in Electrum are too small to be used as team-rooms. As discussed in the II1305 Course Analysis from 2018, the group-rooms in Electrum have too little desk-space, too little floor-space, and are too narrow in shape, to be useful as team-rooms.

Apart from the above-mentioned practical problems with using the group-rooms in Electrum as team-rooms, the Visibility requirement can not be fulfilled; there is no suitable wall that can be seen by all team-members when seated.

For 2019, the examiner decided to have several teams in a larger room, rather than using the group-rooms. This breaks the Isolation requirement, while keeping the Visibility requirement. Reactions from the students were somewhat mixed. Some students commented that working four teams in one room worked well, while other students complained of noise (from discussions in

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other teams), heat (from being 30 people in a room), and getting sick (from one person in the room who came to school with an infection (probably a common cold, or an influenza, judging from descriptions in the comments)).

*Action point 1 for 2020:* Plan for fewer teams in the same room (such as, 3 teams instead of 4).

*Action point 2 for 2020:* Suggest coming to work with an infection as something to discuss when setting up the social contract.

Some students suggested that the rules for absence should be changed. The current rules are, that absence up to 8 hours (one day) is made-up for by extra work that the student decided together with the team, while an absence from 8 hours and up to 40 hours (one week) requires an individual task to be completed after the course. The suggestions were, that sick-leave should be allowed, or that a longer absence than one day should be allowed before requiring the individual task.

*Action point 3 for 2020:* Consider modifying the rules for absence.

Considering more teacher-guidance at sprint-planning and sprint retrospectives, the experience was mixed. Additional guidance was concentrated to sprint retrospectives, as these meetings are the most important ones. Some students commented that more guidance at sprint-planning would have been welcome.

Very generally speaking, providing the right amount of guidance is a matter of balance. Learning from good and bad experiences, and reflecting on mistakes and successes, requires a degree of experimentation that may be hampered by too much guidance from teachers.

When preparing for this year's course (2019), the goal was that each team should have guidance by a teacher at one sprint-planning session, and at two sprint-retrospective sessions. The goal was not completely attained for all teams.

For 2020, one possibility is that each team has guidance by a teacher at exactly one session of sprint planning, and at exactly one session of sprint retrospective. Ideally, the team would have some influence over which particular one of the four sessions of planning would have teacher-guidance, and over which one of the retrospective sessions.

From comments in the individual reflections, it can be concluded that the mandatory social contract was a success. The room-wide social contract across team was also reported to have been useful.

As part of an ongoing general revision of *course plans*, it was found that IE1206 Embedded Electronics should be dropped from the admission requirements for II1305, leaving ID1018, ID1020 and IS1200 as required courses for admission. The main reason is that IE1206 is conditionally elective for one program, while II1305 is compulsory for the same program.

Informal studies by the examiner has also shown that having completed IE1206 is not crucial for successfully completing II1305. The new requirements will be in place from Spring, 2020. In 2019, exceptions to the admission requirements were made for students that had not finished IE1206, so that these students would not have to wait a year for the process of changing the course plan.

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The **action points from 2019** are listed below, with comments.

*Action point 1 for 2019: Make the course's Canvas pages for 2019 public, and make the page on admission requirements available as soon as possible. Comment: done.*

*Action point 2 for 2019: For 2019, the scheduling department has been asked to set aside two larger rooms (övnings-salar) for the course. The intention is that a handful of teams can work in each room, with each team occupying one corner or one wall. Comment: done. For discussion on the results, see above.*

*Action point 3 for 2019: For 2019, advise all students to invite friends, relatives, work colleagues, and others, to the expo. Additional informational activities may be considered. Comment: done.* This year, the expo coincided with a technical conference, so there were a number of visitors unrelated to the course.

*Action point 4 for 2019: The schedule for the expo day and the end-of-sprint days should be reworked. The goal of reworking is to make these days more productive, and/or to explicitly give students free time for activities outside the course. Comment: in 2019, the schedule for end-of-sprint days was changed to avoid slack time in the mornings. Therefore, sprint demos started early, at 8:15. There were some negative comments on this, since some students slightly disrupted the demo by arriving late. The schedule for the expo day was also changed, with preparations starting later than in 2019. The expo-day schedule-change were well-received.*

*Action point 5 for 2019: Investigate the possibility of additional learning activities on test-driven development, and/or Git, during the preparation phase of the course. Also investigate if each team can have guidance from a teacher for one of the team's sprint-planning meetings. Comment: in 2019, there was additional quizzes on Git. There was also a project to develop an automated learning environment for teaching Git. This learning environment will be considered for 2020. There was also teacher-guidance at one of the sprint-planning meetings for each team.*

*Action point 6 for 2019: Continue discussions with colleagues and management, with the goal of having more teachers in the course. Comment: done.*

**In summary**, the course is very well received. Areas where students suggest improvements are mainly the classrooms, and absence or sick-leave.

Three action-points for 2020 are identified by the examiner, in order to improve working conditions and learning opportunities in the course even further. The actions points are repeated here, for easy reference:

Action point 1 for 2020: Have fewer teams in the same room, but keep the large rooms.

Action point 2 for 2020: Suggest coming to work with an infection as something to discuss when setting up the social contract.

Action point 3 for 2020: Consider modifying the rules for absence.