# II2202 Research Methodology and Scientific Writing (II2202 Forskningsmetodik och vetenskapligt skrivande)

Examination: PRO1 7.5 credits

There were two instances of this course:

| | |
|---|---|
| Period 1 (P1) | https://canvas.kth.se/courses/20979 |
| Periods 1-2 (P1&P2) | https://canvas.kth.se/courses/20981 |

## P1: 106 students

### Student details

| | | |
|---|---|---|
| 2 | AVBROTT | Withdrew |
| 5 | REGISTRERAD | Registered |
| 99 | AVKLARAD | Completed |

### Performance

| | | |
|---|---|---|
| 13 | A | 13.13% |
| 45 | B | 45.45% |
| 27 | C | 27.27% |
| 9 | D | 9.09% |
| 5 | E | 5.05% |
| 0 | F | |
| 99 | Total | |

93.4% of total students completed

95.2% of students who did not drop the course, completed the course

### Faculty involved with the course

Examiner: Gerald Q. Maguire Jr.

Teachers: Emil Björnson, Jiantong Li, Marina Petrova, Anders Västberg

- Marina Petrova and Emil Björnson had sections primarily of students from the TCOMM program
- Anders Västberg had a section primarily with student from the TSEDM program
- Jiantong Li had a seciton with the students from the TEBSM program

Students from other programs were mixed with the other students (trying to form groups with two students who had common subject interests for their project).

# P1&P2: 157 students

## Student details

| | | |
|---|---|---|
| 1 | AVBROTT | Withdrew |
| 2 | REGISTRERAD | Registered |
| 154 | AVKLARAD | Completed |

## Performance

| | | |
|---|---|---|
| 33 | A | 21.43% |
| 96 | B | 62.34% |
| 8 | C | 5.19% |
| 10 | D | 6.49% |
| 7 | E | 4.55% |
| 0 | F | |
| 154 | Total | |

98.1% of total students completed

98.7% of students who did not drop the course completed the course

## Faculty involved with the course

Examiner: Gerald Q. Maguire Jr.

Teachers: Magnus Boman, Henrik Boström, Jiantong Li, Gerald Q. Maguire Jr., Jan Ingemar Markendahl, Mihhail Matskin, Qian Wang, and Anders Västberg (only for the purpose of course evaluation)

- Mihhail (Misha) Matskin had the students from AUSM/AUSY yr 1
- Qian Wang had the students from AUSM/AUSY yr 2
- Magnus Boman had the students from DASC/DASE yr 1
- Henrik Boström had the students from DASC/DASE yr 2
- Jan Ingemar Markendahl had the students from HCID/HCIN
- Jiantong Li had the students from INSY/INSM
- Gerald Q. Maguire Jr. had the students from CLNS and VCCO/VCCN

Students from other programs were mixed with the other students (trying to form groups with two students who had common subject interests for their project).

## Course structure and formative + summative assessments

Both courses share the same structure with one running in P1 at half-speed and the other running over P1&P2 at one-quarter speed.

The course contains a series of assignments with formative feedback, these are in the order suggested in the P1&P2 course):

- Power tools and how to use them (with quiz)
- Project planning (with quiz)
- Ethical Research (with quiz)
- Professionalism and Ethics for ICT students (with quiz)
- Ethical Research: Human Subjects and Computer Issues (with quiz)
- Writing and Oral Presentations (with quiz)
- Boosting your research profile: Step 1 having a unique identifier
- Avoiding Plagiarism (with quiz)
- Sustainable Development/Hållbar Utveckling (with quiz)
- Presentation of your proposed research: Ethics & Sustainability
- Quality Assurance (with quiz)
- Quantitative Methods and Tools (with quiz)
- Research plan: First draft of your research plan, presentation, and peer reviewing
- Presenting your Data (with quiz)
- Quantitative exercise
- Privacy, Discoverability, Openness, and Publicity (with quiz)
- Qualitative exercise - with peer review
- Writing the Methods, Results, and Discussion sections (with quiz)
- Writing an abstract with keywords (with quiz)
- Written and oral opposition (with quiz)
- Final report: First draft and Presentation with peer review of draft report and presentation

Note that each of the assignments marked "(with quiz)" includes one or more videos with captions and transcript, lecture notes, and a quiz on the presented material.

The summative assessment for the project grade is based on: project plan, method description, scientific report, and opposition report

These are assessed in the assignments:

- Project proposal + Research plan (see above)
- Written opposition: before final seminar - with peer review
- Final Seminar -- note that this includes an oral opposition by those who wrote the written opposition for this project group
- Final report

The assignment "Presentation of your proposed research: Ethics & Sustainability" is present to ensure that the student really do think about both the ethical aspects and the sustainable development aspects of the research that they plan to do.

## Summary of course evaluation

Of 260 students from both course rounds, 50 students provided an answer or 19%. The workload is difficult to assess as both groups, i.e., those studying at either 50% and 25%, are included in the evaluation. There are two local maximums in the answers: 6-8 hours a week and 15-17 hours a week with a variation from 2 to 40 hours a week.

The LEQ questions have average values between 4.8 to 5.9, so no issue stands out. Most students are positive towards the learning environment. The lowest average is question 4: The course was challenging in a stimulating way (c). Comments indicate that some students know the material from their Bachelor's education, which might be one reason for a slightly lower score.

Students' comments are generally positive towards the course's online format, and they think it is interesting to work with current research topics. Teachers provide helpful feedback and are accessible in *most* cases.

## Student's suggestions for improvement:

There are problems in interacting with other students and teachers in an online format. Some support to make this easier might be needed. More help in choosing a research topic and finding the knowledge gap is requested. Student's needing more help might also be related to the amount of feedback from different supervisors in the teacher team. Additionally, some students think it would be better to do an individual research project, as the Master's degree project is done by an individual.

Some students feel that the material duplicates what they have learned in doing their Bachelor's degree project and one student remarked "I've taken over 7 courses like this in my bachelor's studyes. This course should be waived off, but sadly it seems there is no such course waving mechanism here at kth" – however, it would seem that the student did not read slide 20 of the Introduction

"**Equivalent courses":**

- **"If you have taken an equivalent course you can apply for evaluation of this following KTH's procedures – speak to your study adviser and program coordinator**

- **If you have taken a similar course, but it lacks the material on sustainability or ethics – there is a 1.5 HP course that you can take focused on this material – see II2210 Ethics and Sustainable Development for Engineers …**

  **Evaluation of course equivalents is done by the II2202 course examiner."**

# Analysis

## Changes since the previous year's course

Emil Björnson , Qian Wang, and Jan Ingemar Markendahl were new teachers in the course. The examiner helped these new instructors to come up to speed in this course. One thing that helped was providing an administrative template to help each instructor structure the administration of their students.

A major effort before the course started in September 2020 was to bring videos into compliance with the new law regarding accessibility. Of the more than 12 hours of videos, 89% have captions and transcripts . Additionally, due to a change with KTH Play, they also needed to have new embedded video. Details are given on the next pages. Note that it took more than 5x real-time to take the machine generated captions and correct them and create the transcripts, i.e., for each hour of video it took more than 5 hours to edited the captions and produce the transcript..

**Note**: Jon-Erik Dahlin's videos on sustainable development were **not** available – so they could not be captioned by G. Q. Maguire Jr., but many of them have automatic captions applied by Youtube.

A number of new modules were added to the course

- "Advising sessions and Zoom information" – to deal with the transition to on-line
- "Software that may be useful"
- "Common feedback"
- "Avoid looking stupid"
- "Good examples"
- "Web of Science™ Group - Clarivate Analytics"
- "Parallel courses - for Teachers to be aware of" – just for the teachers in the course

"Software that may be useful" contains the pages: "Software available via KTH", "Open source software", "Datasets", and "Commercial software" – to help students make use of existing tools and data sets.

"Common feedback" is designed to provide some common feedback and includes the pages:

- Some common comments on project plans, research plans, and slide presentations
- Some common writing mistakes and guidance about writing
- Common comments on draft reports and presentations
- Before submitting your paper
- Some hints that you will find useful for your future assignments

"Avoid looking stupid" is designed to give some bad examples to help students understand these mistakes and includes the pages:

- Disclaimers and explanation of this module
- General:
    - Knowing that you are not supposed to use the KTH logo
    - Irrelevant text and irrelevant reference
    - Did you understand that you needed to transform the template to your report?

- Reference related:
  - Did anyone try to find these references?
  - Using a citation in an abstract and the source in the body of the report is Wikipedia!
  - More Wikipedia references
  - Incomplete references - Can you find them?
- Table related:
  - Some problems with tables
  - Number of significant digits
  - Lack of decimal alignment in a table
- Figure related:
- Don't connect discrete data with straight lines in a plot
- Fitting equations to data
- Missing error bars
- Plot - is there a better way to show the data
- Plotting two sets of data on the same plot
- When you have a wide range of data consider scaling

"Good examples" is designed to over some good each and includes the pages:

- Opposition report:
  - Example of a good opposition report-2
- Table related (good examples):
  - Table paired with figure
  - Describing the sampling rate when plotting computer power consumption
- Figure related (good examples):
  - 2D versus 1D views of the data
  - Boxplot without and with outliers
  - Comparing two sets of data
  - Decimal aligned table
  - Good example of curve fitting
  - Looking at the data in multiple ways
  - Petri net model of an embedded system
  - Principal components in 3D
  - Use of a non-linear x axis

The modules "Avoid looking stupid" and "Good examples" are based on examples from reports submitted by earlier students.

"Web of Science™ Group - Clarivate Analytics" provides a number of pages to help students take advantage of some existing tools that they have access to via KTHB.

A new page was added "Keyboard shortcuts when watching videos" – to help students with some short cuts when watching videos via KTH Play – so of which are not documented

## Strengths and weaknesses of the course

The course seems to be very effective in helping the students when it comes to their 2nd cycle degree projects, as is evident from these students' progress in their degree project versus students who have **not** had this course. My impression is that this is consuming a large amount of time by the supervisors of these students – who have not had II2202. Moreover, a number of these supervisors are going group supervision of their students, so that the students can do peer reviews of each other's drafts. However, this would seem to be completely inappropriate for students doing their degree projects in industry – for whom all of their drafts should be confidential until the grade goes to the opponent for the written opposition.

Another strength of this course, what that due to the videos and on-line material it was very easy to move to a 100% on-line course during Fall. The traditional first lecture was replaced with two Zoom sessions (one for the P1 version and the other for the P1&P2 version of the course) and the traditional face-to-face advising of students was easily replaced by Zoom sessions.

Another strength of the course is that the majority of the teachers are working with students in their section that they work with in other courses in the student's particular program, hence they are (a) generally competent in the area, (b) they are aware of what the students are studying, (c) they are aware of the competing demands on the students' time, and (d) they can schedule their advising sessions with the students in their section to avoid conflicts with other courses the students are taking.

One weakness of the course concerns staffing, as it is not always possible to have teachers who are actually knowledgeable enough in the area to provide good guidance to the students in their section.

Another weakness is that some of the teachers did not use Canvas to provide feedback to the students, thus the examiner has no easy way to handle problems or to see if the teacher is being effective in guiding the students.

Another weakness, in this case an administrative weakness, is that splitting the students into section based upon their program and specialization and having a teacher for this section – requires special permissions in Canvas. This has meant that Gerald Q. Maguire Jr. has handled this task since he introduced this approach a number of years ago.

An administrative weakness of the course is that since the projects are done in groups of two students, there are problems with:

- Students who arrive late for the course – this is especially a problem for the EIT students as some have compulsory summer school that this past Fall ran late.
- When one student in a group withdraws from the course, there is a problem of how to handle the remaining student – sometimes it is possible to have this student join two other students to form a group of three student but sometimes the research has progressed to far to make this feasible and the student needs to complete the course by themselves.

- There are also the usual problems of group dynamics, but in general it has been possible to address the problems that have arisen.

| Title | responsible person | duration | hours | minutes | seconds | total seconds |
|---|---|---|---|---|---|---|
| **Ethics** | | | | | | |
| Professionalism and Ethics for ICT students (with quiz) | GQMJr | 33:26 | | 33 | 26 | 2006 |
| Ethical Research (with quiz) | GQMJr | 33:26 | | 33 | 26 | 2006 |
| Ethical Research: Human Subjects and Computer Issues (with quiz) | GQMJr | 23:02 | | 23 | 2 | 1382 |
| **ORCID** | | | | | | |
| ORCID at KTH | Niklas Olsson | 4:07 | | 4 | 7 | 247 |
| Evaluate introduction of new technology_ A case study from the developmment of the ORCID application at KTH | Niklas Olsson | 2:50 | | 2 | 50 | 170 |
| **Sustainable Development/Hållbar Utveckling (with quiz)** | | | | | | |
| Sustainable Development: Introduction | Jon-Erik Dahlin | 15:09 | | 15 | 9 | 909 |
| Sustainable Development: Definitions and perspectives | Jon-Erik Dahlin | 20:43 | | 20 | 43 | 1243 |
| Sustainable Development: Economic, Ecologic, and social sustainability | Jon-Erik Dahlin | 18:43 | | 18 | 43 | 1123 |
| Green Networks | Markus Hidell - I have done this | 17:39 | | 17 | 39 | 1059 |
| | | | | | | |
| | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Avoiding Plagiarism (with quiz) | Bellman | 24:32:00 | | 24 | 32 | 1472 |
| Project planning (with quiz) | GQMJr | 22:39 | | 22 | 39 | 1359 |
| Quality Assurance (with quiz) | Magnus Boman | 01:18:22 | 1 | 18 | 22 | 4702 |
| Boosting your research profile: Step 1 having a unique identifier | GQMJr | | | | | |
| Writing and Oral Presentations (with quiz) | GQMJr | 01:19:45 | 1 | 19 | 45 | 4785 |
| **Quantitative Methods and Tools (with quiz)** | | | | | | |
| Introduction to Quantitative Research Methods | MTS – I have done this | 1:30:13 | 1 | 30 | 13 | 5413 |
| Quantitative tools with Excel and R | GQMJr | 45:42 | | 45 | 42 | 2742 |
| Advanced Quantitative Tools using R | GQMJr | 49:23 | | 49 | 23 | 2963 |
| Power tools and how to use them (with quiz) | GQMJr | 47:43 | | 47 | 43 | 2863 |
| Privacy, Discoverability, Openness, and Publicity (with quiz) | GQMJr | 47:08 | | 47 | 8 | 2828 |
| Presenting your Data (with quiz) | GQMJr | 20:03 | | 20 | 3 | 1203 |
| Writing an abstract with keywords (with quiz) | GQMJr | 12:42 | | 12 | 42 | 762 |
| **Writing the Methods, Results, and Discussion sections (with quiz)** | | | | | | |
| Methods section | GQMJr | 6:13 | | 6 | 13 | 373 |
| Result section | GQMJr | 6:20 | | 6 | 20 | 380 |
| Discussion section | GQMJr | 9:30 | | 9 | 30 | 570 |
| Written and oral opposition (with quiz) | GQMJr | 20:13 | | 20 | 13 | 1213 |

## Summary of the teacher's views

One problem in staffing the course is that some of the teachers in particular subject areas view themselves being too heavily loaded to be a teacher in this course. Hence they do not recognize their self interest in helping these students with a research project that produces a short report, as opposed to a degree project. In some cases, these teachers do not think that the course is "that important".

This is a very demanding course in terms of requiring the teachers to have **broad competence** in the area of the students that they are to guide. Additionally, these teachers have to also remember that the grading for the course is **not** about the quality of the research result, but rather of summative assessments (as described earlier in this document).

## Proposal regarding potential changes to the course

As the examiner, I plan to use the 100% on-line approach for Fall 2021 (with regard to the first lecture for both groups). This has also lead to the ability to **uncap** the enrollments for the course, as we no longer have to worry about the seating capacity of our largest lecture hall in Kista (Sal A). Additionally, the use of Zoom means that students do not have problems getting to and from the Kista campus. It will be up to the individual teachers how they wish to schedule their advising sessions and whether they want to use Zoom or not.

A new teacher (Masoumeh Ebrahimi ("Azin")) from Embedded Systems will replace Jiantong Li. My expectation is that she will be a better match subject wise with the (TEBSM) students taking the course. Marina Petrova is not expected to participate in the course in Fall 2021; however, I assume that someone else from the Communication Systems division will be a teacher to advise students from the TCOMM program. There is still some uncertainty about who will be teachers in the course.

As a number of students remarked (in various ways) that there was unequal participation by the memebrs of the team, the following text has been added to the grading slide in the introduction lecture:

> "Note that the final grades are assigned **individually**, therefore if your teammate is not contributing equally: (1) discuss this with them, (2) discuss this with the teacher working with your section, and (3) discuss this with the examiner."

It would be useful to automate the assignment of students to the sections based upon their program (the examiner now has a way to get this information). Another useful feature would be to automate the addition of the group numbers to a custom column in the grade book. Currently this is done manually by the examiner for all of the students in each instance of the course. Having this information enables the teacher for a given section to sort the gradebook by project group – hence making it easier to track the progress of their pairs of students (as the project is in group with 2 students).

A student in the course survey indicated that they were dyslexic but had not registered with FUNKA "because it takes more time than it was given when I was going to be at KTH of 1 Year" and they did not know what help they would have gotten. As an examiner, I am concerned that this student did not contact FUNKA or myself. Additionally, as this condition is increasingly common for students at KTH, I think that I would need the help of a pedagogic developer who has expertise in this area to go beyond the multiple ways that content in this course is already presented in a largely self-paced manner.

As a number students indicated they wanted more examples of potential topics, I have created two lists of part titles (separately for the P1 and P1&P2 courses).