

Course Analysis

EQ2310 Digital Communications

Ragnar Thobaben, ISE, EECS, KTH

Course Data

Course name	Digital Communications
Course code	EQ2310
Credits	9 cu
Prerequisites	EQ1220/EQ1270 Signal theory, or equivalent.
Term	HT19, P2 and VT20, P3
Participation	27 registered students, 22 actively participating students Targeted student groups: TINNM, TSCRM, TEBSM, TIVNM
Teacher	Ragnar Thobaben (course responsible, examiner) Email: ragnart@kth.se
TAs at the tutorials	Hasan Basri Celebi Email: hbcelebi@kth.se Amirreza Zamanisiboni Email: amizam@kth.se
Lectures	14 lectures, 2h per lecture
Tutorials	14 tutorials, 2h per tutorial
Project and Lab	1 project assignment, 1 lab session
Examination	Written exam, 5h
Examination rate	18 of 22 actively participating students passed the course

Background

The course Digital Communications is a well established fundamentals course that is annually offered by the Division of Information Science and Engineering at the EECS School. Between 2010 and 2018, the course has been offered by Prof. Lars Kildehøj. In 2019, Assoc. Prof. Ragnar Thobaben has taken over the course responsibility. The course is offered to first-year Master students from the Master programmes TINNM, TSCRM, TEBSM, TIVNM, and it is usually followed by around 30 students per year on average. It is a mandatory course in TINNM and a recommended/optional course in TSCRM, TEBSM, TIVNM. The course gives a broad introduction to the principles of digital communication systems and summarises the underlying theory. Problem formulation and analysis with mathematical models are the most important aspects of the course.

The course goals are as follows; after passing the course, the student should be able to:

- justify the fact that the implementation and the development of modern communication technology require mathematical modelling and problem solving
- explain basic principles and theoretical concepts behind different technologies in modern digital communications, especially in modulation and detection, channel modeling, carrier modulation, channel coding and error protection

- formulate a mathematical model that is applicable and relevant for a given problem in the area use a given or individually formulated mathematical model for solving a given technical problem in the area and analyse the result and its reasonableness
- compare different technologies in modern digital communication techniques, contrast different technologies against one another and assess the suitability of individual technologies in different situations
- carry out, analyse and report simple hardware based experiments in the area develop simple programme code, e.g., by means of the tool Matlab, and use this code to simulate and analyse problems in the area, and report the implementation and the result.

The course is based on the textbook “Fundamentals of Digital Communications,” Upamanyu Madhow, Cambridge 2008.

Course Design

The course consists of 14 lectures and 14 tutorial sessions in Period 2 as well as a small project and a lab in the beginning of Period 3. The lectures convey the main content of the course. The tutorial sessions provide additional examples and focus on mathematical problem solving. In the project, the students implement a simple communication system in Matlab and compare the performance obtained by simulations with a mathematical model, and in the lab assignment, the students conduct simple experiments on a USRP software defined radio platform. The examination of the course is based on a 5h written exam at the end of Period 2 as well as completed project and lab assignments in Period 3. All assignments need to be passed in order to pass the course. The final grade is determined by the grade from the final exam.

Changes and Updates in HT19: Compared to previous course rounds we implemented the following changes that mainly affected the lectures:

1. **Reading Assignments and Canvas Quizzes:** In order to encourage students to complete the reading assignments accompanying the lectures before coming to the lecture, we introduced Canvas quizzes with concept questions (one quiz per lecture, five questions per quiz) that have to be completed before the lecture. In order to increase the incentive for completing the quizzes, points collected in the quizzes were translated into bonus points on the written exam. The quizzes replaced the essay assignments that were used to trigger early student engagement in the course in previous years but did not reach the desired effect in an effective way.
2. **Lectures and Lecture Material:** The lectures generally follow a traditional format where the teacher presents the main content of the course. Updates this year focused on the lecture material, which was revised to improve clarity and to remove non-constructive redundancy. We also integrated the questions from the Canvas quizzes in order to have (at least) five structured discussion opportunities to activate the students during the lectures, to rectify misconceptions, and to provide feedback.
3. **Video Recordings** Upon request by the students roughly 2/3 of the lectures were recorded in class by using screen-capture videos and provided to the students after the lectures. In this way, students could revisit lectures if necessary and follow the course while traveling.

The format of the tutorial sessions, the project, and the lab remained unchanged.

Student Performance in HT19

Table 1 shows the distribution of grades in HT19 (aggregated results from the first exam in January and the re-exam in March) and the grades from HT18 for comparison. We note that 5 of the 8 students that did not pass the course never actively participated in the course activities. We note as well that the first exam in January was conducted in the usual way in a lecture hall whereas the re-exam was conducted remotely via Zoom and Canvas as a consequences of the lockdown due to the Corona pandemic. Since only three students participated in the re-exam, the impact of the online examination on the grade distribution is rather low. Comparing with HT18, we see a positive trend in the grades: a larger fraction of students received the highest grades A, and the fraction of students with grade C is reduced.

Table 1: Distribution of grades in HT19 (27 students in total) and HT18 (39 students in total).

	A	B	C	D	E	Fx	F
HT19	8	4	2	2	2	1	8
HT18	7	5	12	4	5	-	6

Course Evaluation

The course was evaluated using the online system provided by KTH social. The course evaluation was anonymous and based on the standard learning experience questionnaire used at KTH. The course evaluation was open until two days after the written exam. **19 of 27 students participated in the course evaluation.**

Summary Generally, the answers to the questions in the course evaluation were very positive. Most of the students gave very positive or at least neutral marks, and only in very few cases a negative mark was given by an individual student as it seems. For example, the students felt that they worked with interesting issues, the course was challenging in a stimulating way, understanding of key concepts had high priority, they were able to practice and receive feedback without being graded, they were able to learn by collaborating and discussing with others, the course activities enabled them to learn in different ways, they were able to learn from concrete examples that they could relate to, they were able to get support if they needed it, and the assessment on the course was fair and honest. The learning outcomes were clear, and the students felt that the course design helped them in reaching the goals. The responses left in the free-text comments confirm the overall very positive feedback by the students; the students appreciate the reading assignments and the quizzes as well as the provided video recordings. The students point out that the course is challenging but interesting and that the lectures and tutorials are really helpful. The students also felt well supported by the teacher and TAs. Criticism and suggestions for changes are summarized in the following.

Criticism and Suggestions The students identified the following weak spots in the course and suggest the following updates:

1. **Textbook:** As in previous years, the students state that the textbook is dense and hard to follow.
2. **Prerequisites:** Exchange students and students that do not follow the program as intended (e.g., since they have studied abroad) state that the course is challenging if the basics in Signals and System are missing.

3. **Additional Feedback:** One student suggests to give students the opportunity to provide feedback on which concepts in the reading assignment were understood and which concepts need to be addressed more carefully in the lecture.
4. **Additional Examples:** Some students suggest to add additional real-life examples.

Workload in P2 The course credits of 7.5 hp in P2 translate into an expected full-time workload of 5 weeks and an average workload of roughly 22 hours per week over a 9-week period. The responses by the students show that the students stayed well below the expected workload.

Personal Reflection

General Reflection From a teacher's perspective, the course was a bit challenging to teach since the organization of the course material was somewhat chaotic. The first revision this year has improved the situation; however further changes are needed in coming years. Looking at the feedback from the students and the good student performance, the course was very well received (i.e., the students provided very positive feedback) and very successful (i.e., the students performed very well on the exams). The students appreciate the quizzes, and the quizzes turned out to be an effective way for activating the students early on. Since we had several changes in the course this year (new teacher, revised lecture notes, reading assignment with quizzes, bonus points) it is hard to tell how the different measures contributed to the improved student performance. Criticism regarding the choice of textbook has been repeating for a longer time, and we assume that the planned changes for the next course round (see below) will help to resolve this issue.

Impact of the COVID-19 Lockdown Since the re-examination fell into the lockdown period due to the Corona virus spread, we also gained some experience in online examination. The re-exam was implemented as an online exam in Zoom. We used the same format as for a normal exam, and the exam papers were distributed and solutions were collected via Canvas. Since we only had very few participants, the students were monitored by the teacher and TAs in the course. The students behaved well during the exam. We noticed however that it is challenging to conduct an online exam in a way that guarantees trust in the results and does not lead to disturbances and additional stress for the students. A general problem is that work places and desks in student homes are not designed for online examinations, and the lack of video equipment (e.g., separate cameras, tripods) makes it impossible to place cameras in way that allows teachers to oversee everything that is going on in the closer environment of the students.

Conclusions and Next Steps

For the next course round, we plan to turn the course into a flipped class-room course, where 12 of 14 lectures will be flipped. For each flipped lecture, we will develop the following material:

1. The content of each lecture will be broken down into 6-8 smaller modules presented in short videos of 10-15 minutes.
2. The quizzes in Canvas will be extended and adapted to the structure of the video modules. Additional small assignments will be added in preparation for the class-room sessions.

3. The material for the classroom sessions will follow up on the Canvas quizzes and the additional preparation material. Additional examples and discussion material will be added.

In order to make the exams more robust against unforeseen changes in regulations due to the ongoing pandemic, we will also investigate how a continuous examination in parallel to the course activities can be implemented in a trustworthy way. At this point in time, we foresee an implementation through a series of 3-4 smaller take-home exam, combined with a shorter final examination or an interview.

Finally, in order to be come less dependent on lab spaces and infrastructure, we will investigate solutions to implement the software-defined radio lab sessions remotely. However, safety and security concerns lead to challenges that need to be resolved first.

EQ2310 - 2019-12-09

Respondents: 27
 Answer Count: 19
 Answer Frequency: 70.37%

ESTIMATED WORKLOAD

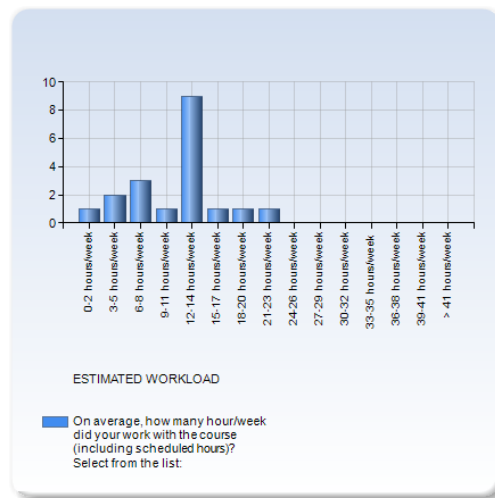
On average, how many hour/week did your work with the course (including scheduled hours)?

Select from the list:

ESTIMATED WORKLOAD

On average, how many hour/week did your work with the course (including scheduled hours)?

Select from the list:	Number of Responses
0-2 hours/week	1 (5.3%)
3-5 hours/week	2 (10.5%)
6-8 hours/week	3 (15.8%)
9-11 hours/week	1 (5.3%)
12-14 hours/week	9 (47.4%)
15-17 hours/week	1 (5.3%)
18-20 hours/week	1 (5.3%)
21-23 hours/week	1 (5.3%)
24-26 hours/week	0 (0.0%)
27-29 hours/week	0 (0.0%)
30-32 hours/week	0 (0.0%)
33-35 hours/week	0 (0.0%)
36-38 hours/week	0 (0.0%)
39-41 hours/week	0 (0.0%)
> 41 hours/week	0 (0.0%)
Total	19 (100.0%)



<u>ESTIMATED WORKLOAD</u>	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
On average, how many hour/week did your work with the course (including scheduled hours)?								
Select from the list:	4.4	1.7	39.4 %	1.0	3.0	5.0	5.0	8.0

Please comment on the course from this perspective:

Besides the quizzes there is no evaluation during the period therefore the time spend after classes is diminished
2x2h of lectures, 2x3h of reading assignments and 2x2h of tutorials. I would have done the tutorials on my own if I had more time so I would add 2x2h of tutorial preparation for an ideal student.

It is OK.

To complete quizzes.

Not too long

nice work load, balanced homework

I think I should invest more time studying this course

Not much. Learning in class is enough. However, homeworks need much more effort to do well.

I had a lot of other things to do, eg interviewing for jobs, so since I have done more advanced courses on most of these concepts and am only looking to pass this course, not get an A I just did the reading and quizzes and am focusing on studying for the exam now.

ESTIMATED WORKLOAD

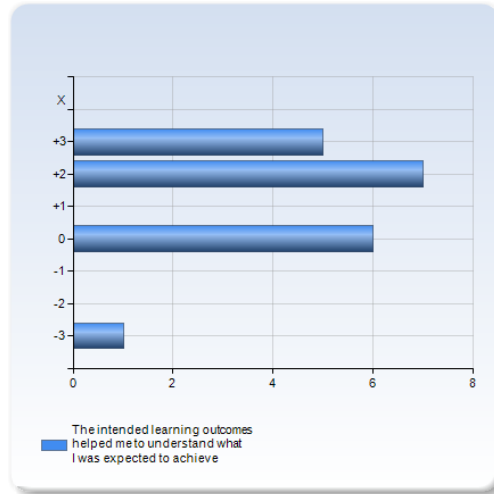
On average, how many hour/week did your work with the course (including scheduled hours)?

Select from the list:

- 5
- 5
- 4
- 5
- 5
- 5
- 3
- 2
- 3
- 6
- 5
- 5
- 3
- 2
- 7
- 5
- 8
- 5
- 1

The intended learning outcomes helped me to understand what I was expected to achieve

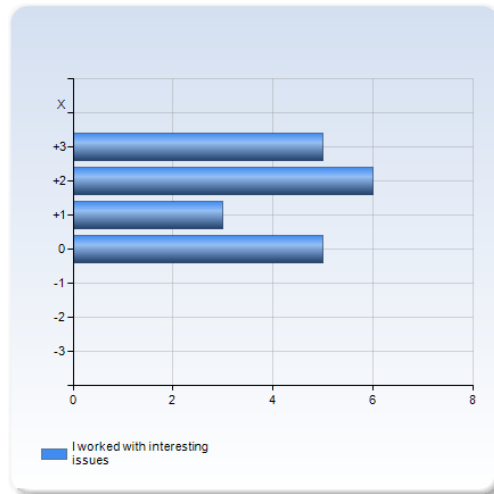
The intended learning outcomes helped me to understand what I was expected to achieve	Number of Responses	Cumulated Responses
-3	1 (5.3%)	1 (5.3%)
-2	0 (0.0%)	1 (5.3%)
-1	0 (0.0%)	1 (5.3%)
0	6 (31.6%)	7 (36.8%)
+1	0 (0.0%)	7 (36.8%)
+2	7 (36.8%)	14 (73.7%)
+3	5 (26.3%)	19 (100.0%)
X	0 (0.0%)	19 (100.0%)
Total	19 (100.0%)	19 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
The intended learning outcomes helped me to understand what I was expected to achieve	5.4	1.6	29.9 %	1.0	4.0	6.0	6.5	7.0

I worked with interesting issues

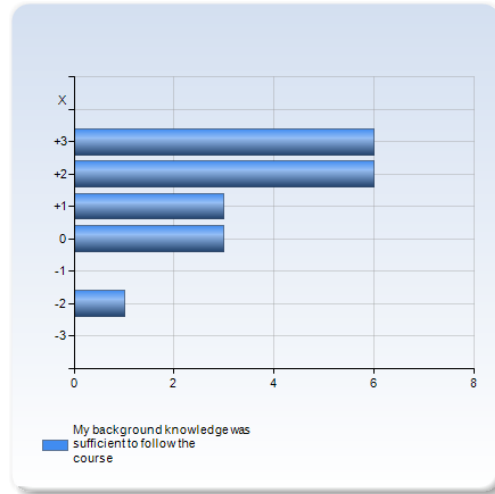
I worked with interesting issues	Number of Responses	Cumulated Responses
-3	0 (0.0%)	0 (0.0%)
-2	0 (0.0%)	0 (0.0%)
-1	0 (0.0%)	0 (0.0%)
0	5 (26.3%)	5 (26.3%)
+1	3 (15.8%)	8 (42.1%)
+2	6 (31.6%)	14 (73.7%)
+3	5 (26.3%)	19 (100.0%)
X	0 (0.0%)	19 (100.0%)
Total	19 (100.0%)	19 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
I worked with interesting issues	5.6	1.2	21.0 %	4.0	4.5	6.0	6.5	7.0

My background knowledge was sufficient to follow the course

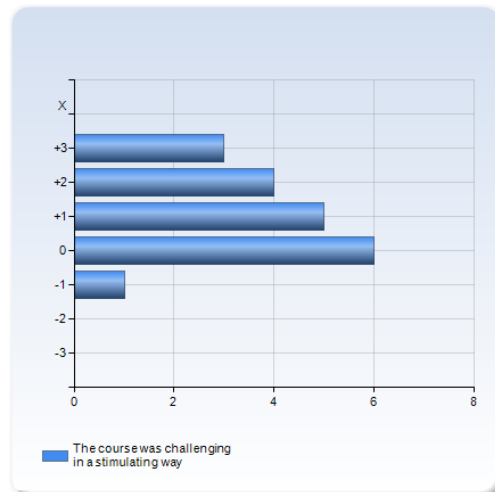
My background knowledge was sufficient to follow the course	Number of Responses	Cumulated Responses
-3	0 (0.0%)	0 (0.0%)
-2	1 (5.3%)	1 (5.3%)
-1	0 (0.0%)	1 (5.3%)
0	3 (15.8%)	4 (21.1%)
+1	3 (15.8%)	7 (36.8%)
+2	6 (31.6%)	13 (68.4%)
+3	6 (31.6%)	19 (100.0%)
X	0 (0.0%)	19 (100.0%)
Total	19 (100.0%)	19 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
My background knowledge was sufficient to follow the course	5.6	1.4	24.6 %	2.0	5.0	6.0	7.0	7.0

The course was challenging in a stimulating way

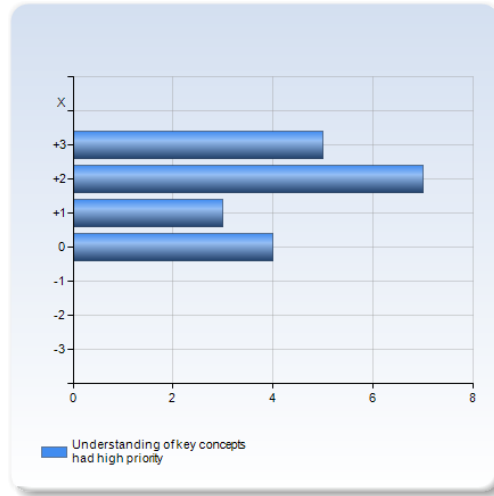
The course was challenging in a stimulating way	Number of Responses	Cumulated Responses
-3	0 (0.0%)	0 (0.0%)
-2	0 (0.0%)	0 (0.0%)
-1	1 (5.3%)	1 (5.3%)
0	6 (31.6%)	7 (36.8%)
+1	5 (26.3%)	12 (63.2%)
+2	4 (21.1%)	16 (84.2%)
+3	3 (15.8%)	19 (100.0%)
X	0 (0.0%)	19 (100.0%)
Total	19 (100.0%)	19 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
The course was challenging in a stimulating way	5.1	1.2	23.4 %	3.0	4.0	5.0	6.0	7.0

Understanding of key concepts had high priority

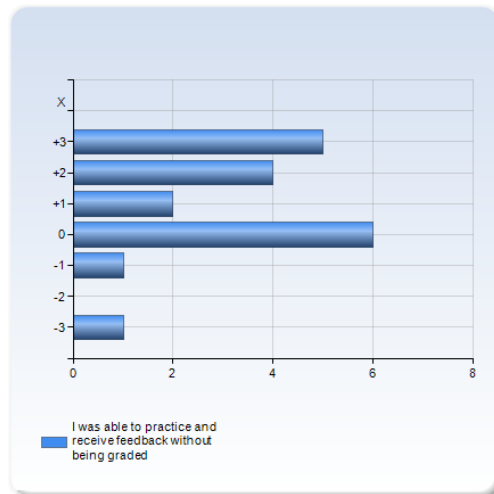
Understanding of key concepts had high priority	Number of Responses	Cumulated Responses
-3	0 (0.0%)	0 (0.0%)
-2	0 (0.0%)	0 (0.0%)
-1	0 (0.0%)	0 (0.0%)
0	4 (21.1%)	4 (21.1%)
+1	3 (15.8%)	7 (36.8%)
+2	7 (36.8%)	14 (73.7%)
+3	5 (26.3%)	19 (100.0%)
X	0 (0.0%)	19 (100.0%)
Total	19 (100.0%)	19 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
Understanding of key concepts had high priority	5.7	1.1	19.5 %	4.0	5.0	6.0	6.5	7.0

I was able to practice and receive feedback without being graded

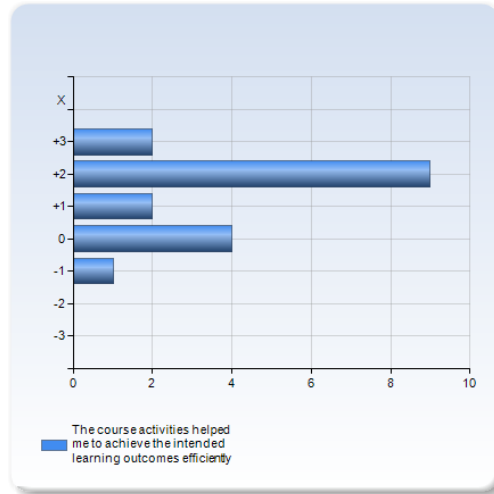
I was able to practice and receive feedback without being graded	Number of Responses	Cumulated Responses
-3	1 (5.3%)	1 (5.3%)
-2	0 (0.0%)	1 (5.3%)
-1	1 (5.3%)	2 (10.5%)
0	6 (31.6%)	8 (42.1%)
+1	2 (10.5%)	10 (52.6%)
+2	4 (21.1%)	14 (73.7%)
+3	5 (26.3%)	19 (100.0%)
X	0 (0.0%)	19 (100.0%)
Total	19 (100.0%)	19 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
I was able to practice and receive feedback without being graded	5.1	1.7	32.6 %	1.0	4.0	5.0	6.5	7.0

The course activities helped me to achieve the intended learning outcomes efficiently

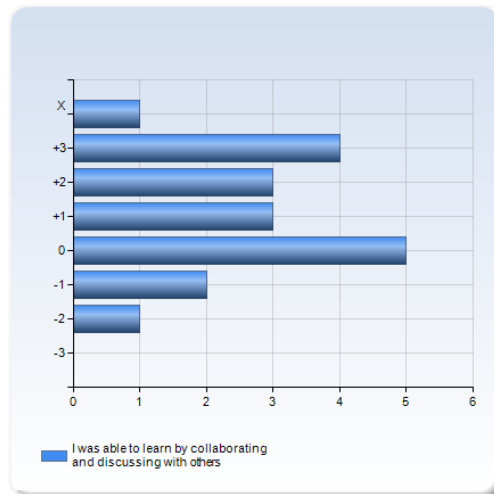
The course activities helped me to achieve the intended learning outcomes efficiently	Number of Responses	Cumulated Responses
-3	0 (0.0%)	0 (0.0%)
-2	0 (0.0%)	0 (0.0%)
-1	1 (5.6%)	1 (5.6%)
0	4 (22.2%)	5 (27.8%)
+1	2 (11.1%)	7 (38.9%)
+2	9 (50.0%)	16 (88.9%)
+3	2 (11.1%)	18 (100.0%)
X	0 (0.0%)	18 (100.0%)
Total	18 (100.0%)	18 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
The course activities helped me to achieve the intended learning outcomes efficiently	5.4	1.1	21.2 %	3.0	4.5	6.0	6.0	7.0

I was able to learn by collaborating and discussing with others

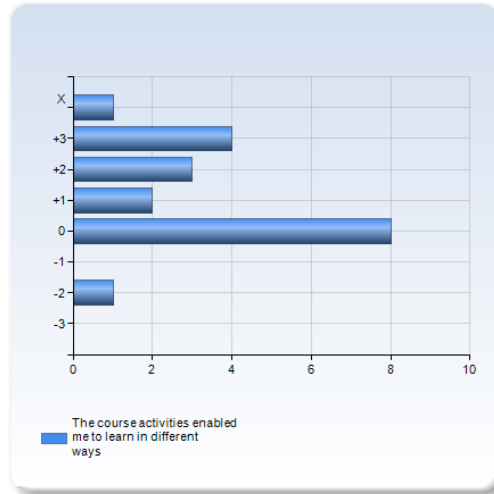
I was able to learn by collaborating and discussing with others	Number of Responses	Cumulated Responses
-3	0 (0.0%)	0 (0.0%)
-2	1 (5.3%)	1 (5.3%)
-1	2 (10.5%)	3 (15.8%)
0	5 (26.3%)	8 (42.1%)
+1	3 (15.8%)	11 (57.9%)
+2	3 (15.8%)	14 (73.7%)
+3	4 (21.1%)	18 (94.7%)
X	1 (5.3%)	19 (100.0%)
Total	19 (100.0%)	19 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
I was able to learn by collaborating and discussing with others	5.1	1.7	32.6 %	2.0	4.0	5.0	6.5	8.0

The course activities enabled me to learn in different ways

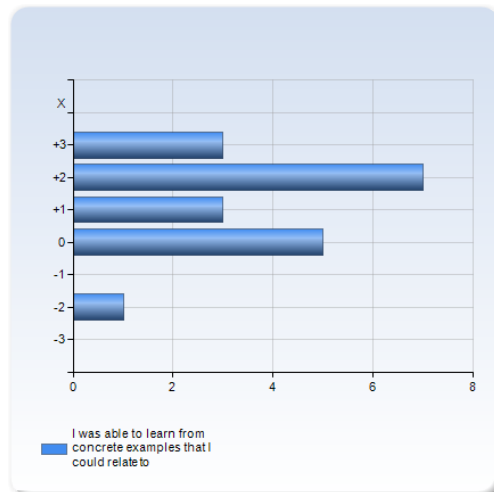
The course activities enabled me to learn in different ways	Number of Responses	Cumulated Responses
-3	0 (0.0%)	0 (0.0%)
-2	1 (5.3%)	1 (5.3%)
-1	0 (0.0%)	1 (5.3%)
0	8 (42.1%)	9 (47.4%)
+1	2 (10.5%)	11 (57.9%)
+2	3 (15.8%)	14 (73.7%)
+3	4 (21.1%)	18 (94.7%)
X	1 (5.3%)	19 (100.0%)
Total	19 (100.0%)	19 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
The course activities enabled me to learn in different ways	5.2	1.6	30.5 %	2.0	4.0	5.0	6.5	8.0

I was able to learn from concrete examples that I could relate to

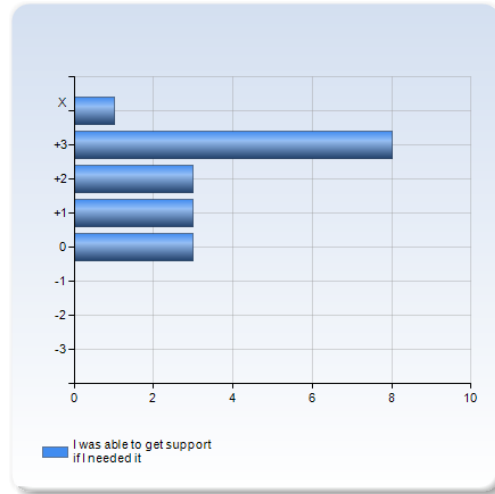
I was able to learn from concrete examples that I could relate to	Number of Responses	Cumulated Responses
-3	0 (0.0%)	0 (0.0%)
-2	1 (5.3%)	1 (5.3%)
-1	0 (0.0%)	1 (5.3%)
0	5 (26.3%)	6 (31.6%)
+1	3 (15.8%)	9 (47.4%)
+2	7 (36.8%)	16 (84.2%)
+3	3 (15.8%)	19 (100.0%)
X	0 (0.0%)	19 (100.0%)
Total	19 (100.0%)	19 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
I was able to learn from concrete examples that I could relate to	5.3	1.3	25.2 %	2.0	4.0	6.0	6.0	7.0

I was able to get support if I needed it

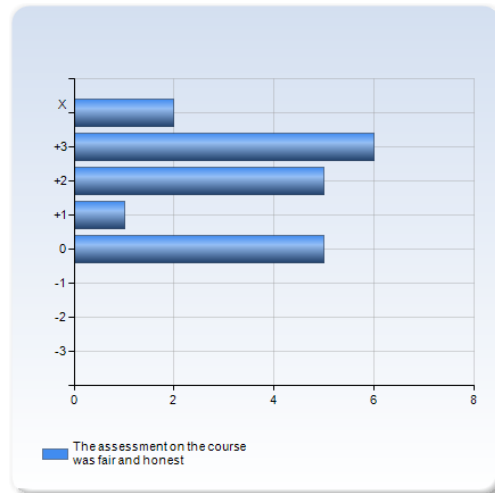
I was able to get support if I needed it	Number of Responses	Cumulated Responses
-3	0 (0.0%)	0 (0.0%)
-2	0 (0.0%)	0 (0.0%)
-1	0 (0.0%)	0 (0.0%)
0	3 (16.7%)	3 (16.7%)
+1	3 (16.7%)	6 (33.3%)
+2	3 (16.7%)	9 (50.0%)
+3	8 (44.4%)	17 (94.4%)
X	1 (5.6%)	18 (100.0%)
Total	18 (100.0%)	18 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
I was able to get support if I needed it	6.1	1.3	20.8 %	4.0	5.0	6.5	7.0	8.0

The assessment on the course was fair and honest

The assessment on the course was fair and honest	Number of Responses	Cumulated Responses
-3	0 (0.0%)	0 (0.0%)
-2	0 (0.0%)	0 (0.0%)
-1	0 (0.0%)	0 (0.0%)
0	5 (26.3%)	5 (26.3%)
+1	1 (5.3%)	6 (31.6%)
+2	5 (26.3%)	11 (57.9%)
+3	6 (31.6%)	17 (89.5%)
X	2 (10.5%)	19 (100.0%)
Total	19 (100.0%)	19 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
The assessment on the course was fair and honest	5.9	1.4	23.4 %	4.0	4.5	6.0	7.0	8.0

The intended learning outcomes helped me to understand what I was expected to achieve -
I never read the intended learning outcomes of a course

My background knowledge was sufficient to follow the course -

As an exchange student I was missing the background of signal theory
 That's my bad, I should have done Signal Theory before
 I did the courses in the wrong order since I missed this last year when I was in the US

I was able to practice and receive feedback without being graded -

I should have done the tutorials beforehand
 I liked the quizzes!

The course activities helped me to achieve the intended learning outcomes efficiently -

I feel that the tutorials don't cover all the key concepts
 Probably, but I am not a good measurement

I was able to learn by collaborating and discussing with others -

I never tried to

The course activities enabled me to learn in different ways -

I really liked that the later classes were recorded

I was able to learn from concrete examples that I could relate to -

I always think things are abstract and like it that way

The assessment on the course was fair and honest -

Cant answer this since it is not graded yet

GENERAL QUESTIONS**What was the best aspect of the course?****GENERAL QUESTIONS****What was the best aspect of the course?**

The teacher was nice and really invested in the course. The material covered was interesting.
 The Quizz were nice because we needed to read the book and just understand the most important concept without having really well understood the material. Even if it is really easy to get 60/60, I think it is a good idea to keep them
 The content covered seems very intersting. Tutorial classes were helpful
 The lectures were really helpful!
 The video lecture is very helpful.
 The teacher is very interesting.
 Tutorials are very helpful.
 Not too hard
 Teacher cares if we actually got the point
 The slides are well designed and organized, which helps me understand the content of the textbook easily.
 Clear structure
 The best part were the lectures, they were easy to follow and understand.
 It followed the textbook closely and the teachers was good at supplying the mathematical rigour required to get a deeper understanding of the subject.
 I think Ragnar is a really good teacher, I just have a hard time concentrating during lectures. The recorded sessions lets me learn at my own pace.

What would you suggest to improve?

What would you suggest to improve?

- From my student point of view the book is not really good. Most of the time, I understood almost nothing thinking that the material was really complicated and then during the lectures it seemed not that difficult. I think examples are missing and we don't really know when we are speaking about the real part or the complex part or even if there is a reason to separate the two.
- From what I have understood the main goal of reading before the lectures is to have a large view of the subject and being more prepared during the lectures. Maybe even a book that is simpler would be nice because then during the lecture we would go deeper.
- Also, sometimes, I read the book and the material was easy and so I was a little bit boring during the lectures...
- What I can suggest is in addition of the quizz, make a second quizz that would ask how the student have understood each different part of the material covered in the reading assignment. Then, during the lectures, we could take more time on the subject that was harder. Because sometimes, we took too much time on the first part that was often easier and then we had to rush the end that was harder. For exemple, during the review 9, I think everyone had already seen the notion of entropy so we could have taken less time on that and focus more on the channel capacity topic.
- Tutorials friday afternoon not the best idea. Any other timeslot would be better
- The book is really dense and without any didactic examples, the examples given were used to go in-depth rather than explain the theory.
- I think it may be better if we can get the question sheet on every tutorial.
- I think it's already very good.
- I think time of tutorials could be rescheduled.
- Already good enough
- I think we need more real life exampls to understand the mathematical principles we learned in class.
- more practice
- The tutorials they had to much to go through and there were no explanations with the solutions.
- The lectures sometimes felt like lectures in mathematics and would perhaps be taught better by a classical "black board" approach where the teacher writes down the equations and proofs. Also, I think it would be possible to supply more intuition behind the mathematical manipulations. For instance, when explaining modulation, maybe the lecturer could have build up the equations from a simple example (like transmitting a sequence of bits with a rectangular pulse or a raised cosine pulse or something like that). It is a little hard to follow everything just by looking at slides.
- I dont like it when the exam is in two parts

What advice would you like to give to future participants?

What advice would you like to give to future participants?

- Go to the tutorial classes
- The book is quite a pain. Don't try to understand everything and ask questions during the lectures on what is still not understood.
- Make enough preparations for each lecture.
- Thinking deeply.
- The teacher is very nice!
- Study hard and you'll get there
- Reading the textbook is challenging and a lot of its exercises are quite hard to solve, don't waste too much time on them when you first get in touch with some topics of this course.
- read the book before attending class
- Don't miss the begining lectures, it becomes very difficult to follow
- Seek out more lighter sources of information to complement the lectures and the textbook, to get more of a feel and intuition for the subject.
- Maybe another book that is not so mathematically concise. Still read through the assigned textbook and go to the lectures, though!
- Nothing

Is there anything else you would like to add?

Is there anything else you would like to add?

- A pleasure to come to the lectures. Thank you !
-
- No.
- No.
- Nothing
- Nope
- Nope, thank you.
- review after class
- It is a very hard but also a fun course.
- I am sorry for not working harder on this course, it is nothing personal I am just tired of school and want to start working.

YOUR PROFILE

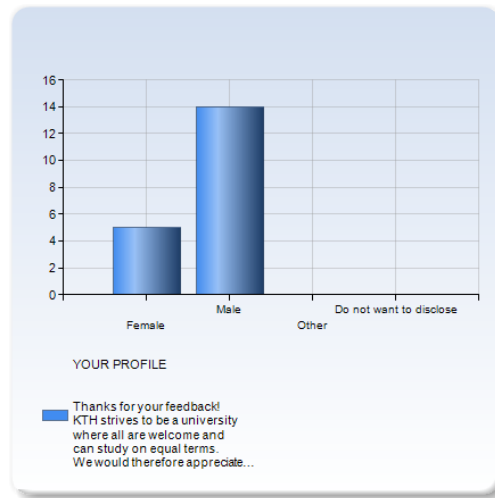
Thanks for your feedback!

KTH strives to be a university where all are welcome and can study on equal terms. We would therefore appreciate if you provided some background information about yourself.

These data are used only to compare the learning experience between different groups of participants, where at least three need to be included in a group in order to display any results.

I am:

YOUR PROFILE	
Thanks for your feedback!	
KTH strives to be a university where all are welcome and can study on equal terms. We would therefore appreciate if you provided some background information about yourself.	
These data are used only to compare the learning experience between different groups of participants, where at least three need to be included in a group in order to display any results.	
I am:	Number of Responses
Female	5 (26.3%)
Male	14 (73.7%)
Other	0 (0.0%)
Do not want to disclose	0 (0.0%)
Total	19 (100.0%)



YOUR PROFILE	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
Thanks for your feedback!								
KTH strives to be a university where all are welcome and can study on equal terms. We would therefore appreciate if you provided some background information about yourself.								
These data are used only to compare the learning experience between different groups of participants, where at least three need to be included in a group in order to display any results.								
I am:	1.7	0.5	26.0 %	1.0	1.5	2.0	2.0	2.0

Please comment on the course from this perspective:

- Nothing.
- Nothing
- equal treatment
- The course is not related to the gender.
- Well, its not that anonymous if I say I am a girl

YOUR PROFILE

Thanks for your feedback!

KTH strives to be a university where all are welcome and can study on equal terms. We would therefore appreciate if you provided some background information about yourself.

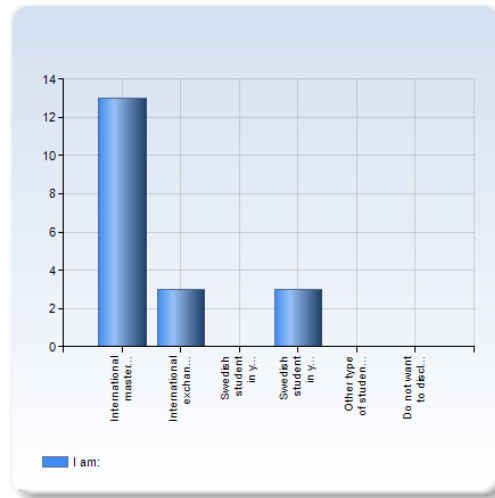
These data are used only to compare the learning experience between different groups of participants, where at least three need to be included in a group in order to display any results.

I am:

- 2
- 2
- 2
- 2
- 2
- 2
- 2
- 1
- 1
- 2
- 2
- 2
- 1
- 2
- 1
- 2
- 2
- 2
- 2
- 1

I am:

I am:	Number of Responses
International master student	13 (68.4%)
International exchange student	3 (15.8%)
Swedish student in year 1-3	0 (0.0%)
Swedish student in year 4-5	3 (15.8%)
Other type of student	0 (0.0%)
Do not want to disclose	0 (0.0%)
Total	19 (100.0%)



I am:	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
I am:	1.6	1.1	68.4 %	1.0	1.0	1.0	2.0	4.0

Please comment on the course from this perspective:

We didn't take the course of Signal Theory so the beginning of the course was really hard. We didn't take it even if we would have time to do it because otherwise we would have had too much credits for the first semester

Im doing double degree, so not sure if this counts as Exchange .

Nothing.

I like the atmosphere during the class.

Ruizhi Yang

equal treatment

This is my last exam

I am:

2

1

2

1

2

1

1

1

1

1

1

1

1

1

4

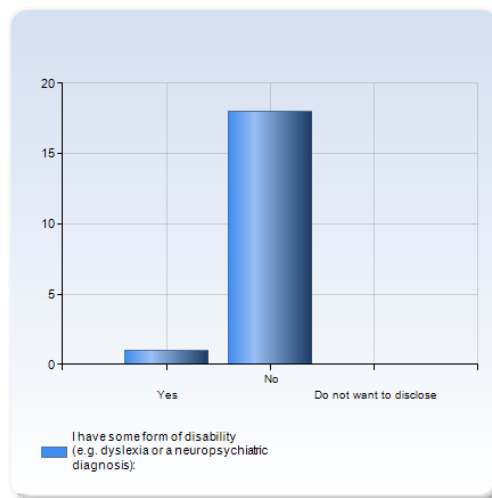
4

1

4

I have some form of disability (e.g. dyslexia or a neuropsychiatric diagnosis):

I have some form of disability (e.g. dyslexia or a neuropsychiatric diagnosis):	Number of Responses
Yes	1 (5.3%)
No	18 (94.7%)
Do not want to disclose	0 (0.0%)
Total	19 (100.0%)



	Mean	Standard Deviation	Coefficient of Variation	Min	Lower Quartile	Median	Upper Quartile	Max
I have some form of disability (e.g. dyslexia or a neuropsychiatric diagnosis):	1.9	0.2	11.8 %	1.0	2.0	2.0	2.0	2.0

Please comment on the course from this perspective:

Nothing.
Nothing.
equal treatment

I have some form of disability (e.g. dyslexia or a neuropsychiatric diagnosis):

- 2
- 2
- 2
- 2
- 2
- 2
- 2
- 2
- 2
- 2
- 2
- 2
- 2
- 2
- 2
- 2
- 1
- 2
- 2
- 2
- 2
- 2
- 2