

48541 Signal Theory
Reflections on Autumn 2005

John Reekie
Faculty of Engineering
University of Technology, Sydney

Contributors

Tim Aubrey
Keiko Yasukawa
Subhash Challa

June 2005

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1 Preliminaries

This short report contains the reflections of the instructors and students concerning the delivery of the subject 48541 Signal Theory in the Autumn 2005 semester. This is the first delivery of a revised version of this subject, which has been undertaken as a collaborative effort by members of the academic staff. In particular, the following people contributed to the review of and evaluation of the existing subjects and the design of the new subjects: Tim Aubrey, Subhash Challa, Martin Evans, Anthony Kadi, John Reekie, and Keiko Yasukawa.

The intent is that the follow-on subject, 48770 Signal Processing, will be revised as well.

2 Personal reflections on Autumn 2005: Keiko

Some reflections:

As you know I had fairly minimal involvement in the subject this semester. I think I got to all but 3 tutorials and labs that I shared with Tim (I had clashes with blocks in my other faculty on the days that I had the clashes). I had some input into the quiz questions and general input into the assignment design (but Tim did the hard bits and details). So my reflections are from this limited perspective.

Overall, I think the subject ran well, thanks to a lot of hard and last minute work, particularly by John and Tim - maybe also Subhash - sorry I didn't have/take the opportunity to discuss Signal Theory with you very much last semester. There was probably a good balance of letting one approach run its course, and opportunities for some adjustments/ input along the way. I don't think we would have been able to plan and improvise on the run, so it was good that John had a clear idea of how we could run with the subject last semester.

My impressions were that in class, students were generally engaged (not a lot of students there just to be counted on the attendance sheet). I didn't feel many of the students looked or felt very confident in what they were doing - but on the other hand, felt the tutorials/ labs were opportunities to get help (and I think they got the help - again, more from Tim, especially in the Matlab). My impressions were that the students generally like the structure of the subject (ie the level of contact, tutorials etc). I heard several students say that the assignments really made them and helped them to make sense of the material, and that it would have been better had they been given to them earlier (I tend to agree, and take some of the responsibility for the tardiness).

I am unsure about the questions we made them do before the tutorials. I agree about requiring them to come to tutorials prepared (if had a serious go at trying to come to grips with the new material). But I felt that the questions facilitated guided note-taking, rather than facilitating meaning making of what they were reading (sorry this is probably a huge generalisation). I would have preferred to see questions that helped them to see connections between what they were reading, and asking them to demonstrate the connections they've made. I thought some of the textbook questions did that, but students only started on some of these types of questions during the tutorial, and not many were sure of what the presented answers meant. In the labs, I felt that many came unprepared, and a lot of time was spent unpacking the Matlab confusion from the conceptual problems.

I think it's important that when we have tutorials, that they are planned and structured in ways that all students benefit. I felt that often when we got students to present answers, they were presenting things that they were unsure of, and whilst they may have got feedback from us, the others were confused by their own lack of knowledge and the presenters' confusion - hence defeating the purpose and missing the opportunity for peer learning. I wonder if it would be better if -

- we have a number of "good" questions that are ready and handed out at the start of semester. Students in pairs or 3s are assigned, say 2? 3? questions each to prepare and present in tutorials. So each week, there may be 4 groups making a formal, well planned presentation. They get

marked for correctness of their answers, clarity of their explanations, and generating a couple of related questions for the rest of the class to solve at the end of their presentation.

- we could brief students either in the tutes or the lectures about what they will be doing in the lab, and mapping out the concepts they will be working with, and discussing approaches to the lab exercises in the tutorials the week before the actual lab.
- we should hand out the assignments early, and spend a lecture clarifying the tasks, and locating the various topics in relation to the skills and knowledge required in completing the assignments.

I think Tim and I need to make sure that ITE next semester takes into account the approaches to learning, as well as content that students will need to be able to build on in Signal Theory.

That's probably all from me. Thanks for the opportunity to comment.

keiko

3 Personal reflections on Autumn 2005: Tim

My turn,

(I have had the benefit of seeing some student responses)

The subject matter remained beyond many of our students (exam and quiz marks, statements made in assignments etc). The reasons for difficulties the students had are difficult to be certain about, given the little evidence we have. And I am not going to fall into the trap of blaming everything that came before. However, students seem to lack confidence in basic mathematical manipulation (ranging across arithmetic, matrix manipulation, etc etc) and in tackling problems generally.

It seems clear from RRCs etc that this is a common problem (blamed for the 76 approaches we can take. The most commonly taken is to ignore these basic problems and push through. My view is that some will be dragged along this way and overcome their lack of confidence, but more often than not students will be unable to attempt problems that they have not seen before and will move further through the course with real problems intact. That may not matter, they tend to graduate and find jobs (and even move on to pg degrees). My own view is that we should heed their problems - how do we get students to "try" things, and transfer what they have covered in other subjects. We did a few things this semester, but maybe not enough.

Students recognised that the introduction was gentle and the end a bit stressful. This can be addressed reasonably easily after our experiences this time. It is acknowledged that the assignments came too late, but it will be easier to get them out earlier this time round.

Students also asked for more help with Matlab. There are some on-line tutorials around, maybe I should get a list together.

Students asked for more worked examples. I guess we can provide these. There is some value in pattern recognition in the early stages of learning, and indeed in solving real problems. But we should be cautious in doing this, or in thinking that there are only benefits.

The tutorial/lab marking was a bit problematic this semester. A bit of unevenness across tutes I suspect, and the students sometimes seemed to expect marks for effort alone. There was possibly too much weighting for this. Comments? There was a bit of copying, rather than collaboration in some lab responses.

I am concerned that we don't get to look at random signals and processes - it used to be part of the subject. We've also lost the physical labs. Any comments?

I think what was done this semester should be built upon. I think we are all a bit more familiar with the approach of the text and what can be left out, and emphasised. I'm looking forward to doing it again.

tim

4 Personal reflections on Autumn 2005: JohnR

Overall, I feel two things about the subject this semester. First, that it would have been nice if it had worked out a little better, and second, that nonetheless we did fairly well under the circumstances and have a pretty solid start. There's still knocking about in my mind this question about why the Faculty doesn't seem to recognize that a developed subject is a knowledge resource (and an expensive one at that!), and that these kinds of investments need to be made where necessary and then protected. If we can preserve the investment we have made this semester then I think the semester's work has been well worthwhile.

We didn't have much choice but to develop the subject "on the fly," as it were. While more up-front development time certainly would have been nice, I think we did a pretty reasonable job under the circumstance. The structure of the subject allowed this to happen, and we somehow managed to hold it mostly together for the whole semester.

I'm actually quite pleased with the textbook (Lee and Varaiya) that we chose. Although many of the examples in the text go beyond what we want to do in our subject, and even though we skipped a few chapters, the basic progression of concepts in the text works really nicely, I think. Now that we have gone through it once, we know what is in it, and what needs to be emphasized more, and when. For example, there are a number of basic things that we will need to work on early on in the subject, which this time around we had assumed (as did the text) that students would simply know or understand. Specifically: basic matrix arithmetic; sine and cosine functions; period; complex numbers; phasors. While we did cover these, I think next time we need to work harder to get students to exercise and develop some basic skills in these areas. We also need to increase the pace quite a bit in about the middle of the semester, as we ended up with too much stuff right at the end.

I do think we can do a better job next time around of mining the resources associated with the Berkeley course (where the text came from). Questions from their large archive of past exams, for example.

As far as subject delivery goes, we initially scheduled two sessions per week, a two-hour lecture and a two-hour tute lab. This was done in the belief that this would help the students, but I now think it was a mistake. I didn't find it difficult to deliver what I felt was appropriate for lecture delivery in an hour per week, and so we could have made things run more efficiently by having a single three-hour session per week. I think the real trick is getting the students to work on the subject material outside of just their three or four hours per week of contact time!

Another thing we had this semester was three separate tutorials. I have to say that I don't much like co-ordinating and lecturing a subject with that system, as I don't get to know students outside of my own tutorial. While this is of course necessary in larger subjects, this subject is small enough (60 or so students) that I think we can probably figure out a way to have more interaction with different tutors and the lecturer next time.

We did have a problem with the assignments being produced too late. I take the blame for that, and I would like to thank Tim for being a hero and pulling that section of the subject out from nowhere and making it work.

Independently of the survey results, my observations were that those students that chose to engage with the material really did get something out of this

subject. You saw this in the labs, and in the LDCs when students were working on their assignments. It seems to me that the Matlab-based assignments were perhaps the part of the subject that most appealed to and motivated the students, and I think that we should emphasize this part of the subject more next time around. I think that we still need tutorials, but my feeling now is that we should use Matlab more as a motivational vehicle.

I guess that brings me to the marking scheme of the tutes and labs. It was my idea to give 5 marks for "completing" the tute and lab for each module, and having done it now, I don't think I want to do it again. On the plus side, almost all students attended and participated (to some degree anyway) in the tutes and labs; on the down side, managing this marking scheme turned out to be a lot of trouble. It was supposed to be simple, but it wasn't. My strong inclination is to revert to a much coarser-grained system, where the non-exam mark consists simply of marks for three (Matlab!) assignments. A lot more students will skip classes, but then again, I've decided that I wouldn't care if the failure rate was higher, we can't work magic for students who don't/won't make an effort.

Well, that's about all I can think of right now. Having written this, I'm now quite looking forward to next semester: we have a subject that we can deliver as-is, and "all" we have to do is improve it! Furthermore, this subject is now open, in the sense that anyone in the Telecoms program or the Faculty for that matter has access to its materials (including the document these reflections will be published in). It's also the result of a co-operative effort by different members of academic staff with quite different backgrounds and perspectives. That in itself is something of an achievement.

JohnR, July 2005

5 Personal reflections on Autumn 2005: Subhash

Hi John, Tim and Keiko,

I agree entirely with Tim and there is something more fundamental that we need to do. I am not sure what and at what stage of students learning.

I also feel that to have 4 full-time academics commitment is a bit of an overkill. It introduces several logistical problems and too many points of view to manage. My view is that, 2 full time staff adequately supported by a few postgraduate students will help everyone involved.

I would like to extend my appreciation to John Reekie for his tenacity and dedication in pulling this through.

Subhash

6 Numeric survey results

6.1 Subject feedback survey (SFS)

Here are the numeric results from the University-run subject feedback survey (SFS) conducted towards the end of the Autumn 2005 semester. The number of responses to the survey was 13. Table 1 summarizes the overall results for Autumn 2005.

The scale used for answers to these questions is:

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree

Nr	Question	Mean	SD
1.	The subject was delivered in a way which was consistent with its stated objectives	3.2	1.1
2.	My learning experiences in this subject were interesting and thought provoking	3.3	1.1
3.	I found the assessment fair and reasonable	3.2	1.1
4.	There were appropriate resources available to support the subject	3.0	1.2
5.	I received constructive feedback when needed	2.9	1.3
6.	The teacher appears to be well prepared and presents the material in an organised manner	2.6	1.2
7.	The teacher is able to explain concepts clearly	3.0	1.1
8.	Overall, I am satisfied with the teaching of this staff member	2.9	1.2
9.	Overall I am satisfied with the quality of this subject	3.0	1.1

Table 1: Subject Feedback Survey results, Autumn 2005

6.2 Written feedback

The University-run Subject Feedback Survey has two open-ended questions at the end. Following are the responses to these questions, with the exception of two students who obviously had personal issues with one or more instructors.

1. *What did you particularly like in this subject?*

- Well structured and defined
- Assignments
- The Matlab part means that it is easy to understand some concepts and how it can be practice this subject can be used
- The lab exercises helped me link the theory with practical
- Delivered in a pace that is suitable for me
- The labs were good, they allow us to visualise our theory work
- The tutorials and labs being worth marks
- The tutorial with Tim Aubrey
- Delivery. People can speak English
- The content and the subject material
- Matlab
- The content has the potential of being extremely interesting
- Matlab
- Not too many topic areas taught
- Labs
- Give overview of signals and systems in real world
- Interesting and practical. John brought real life examples to tie in with the subject.
- John Reekie is a good lecturer and a good tutor.
- Lectures.
- I like the proposed structure of the course i.e. content, text book, labs, course path.
- Interesting subject topic, related to real life
- The lectures were short and easy to understand

2. *Please suggest any improvements that could be made to this subject.*

- Assignments should be given earlier and with more time to do them. There should be fully worked answers for the labs at the end of the semester.
- Far more organised assessments. No feedback for labs was given. All assignments were left until last weeks of subject.
- More support on Matlab should be provided.
- More help in Matlab usage. Answers for questions.

- Assignment deadlines shouldn't land on lab days.
- Subject was coordinated without much structure. Objectives were not clear, we had to learn how to do things ourselves.
- More support at help sessions to help students become familiar with Matlab before labs begin.
- Prepare before semester starts.
- Needs to be more organized, the 2nd assignment was given too late in the semester. The lecturer was not prepared for lectures and sometimes confused us in explaining concepts.
- More organized lectures.
- More organised but fantastic subject.
- More organization is needed.
- More help with tutorials (tutorial questions) and labs, provide some solved examples.
- Tutors should know what's going on.
- Need a better tutor.
- Better preparation for exam papers – ie student went in blind only knowing theory – when what was examined was practice.
- More notice for assignment due dates. More support for how to use Matlab – most of the time we know the theory.'
- Needs more sample questions with fully worked answers
- Need assignment earlier.
- Assessment provided with more notice.
- More help in labs for Matlab, lab time is not enough.
- Make subject easier.
- Better tutor teachers.
- Propose tutorial solutions on the web. propose demonstration of Matlab commands.
- A lot more feedback should be needed. Lecture notes are confusing, no similarity with the textbook.
- Follow that structure consistently and do examples.
- I think I would have liked the subject had I been satisfied with my learning progress. I feel as if I haven't learned much during the course.
- Please release answers to tutorial questions!! Not all of us can attend the LDC times for a tutor who *should*

6.3 Discussion

The numeric results are disappointing. Various issues caused by lack of preparation time certainly had a negative effect on the student perception of the subject. Bearing in mind that this is a completely new subject, it's not a complete disaster and next semester's results should be much better, now that we have dealt with some of the key issues that bogged the subject down this semester.

One thing to note is that the variance of the results is quite high. Looking through the survey responses confirms that students tended to *either* rate the subject reasonably well (neutral or better), or poorly (neutral or worse).

The written responses provide strong indications of where improvement is needed. Note that, although there were a lot of areas identified for improvement, many students commented positively on the practical "real world" emphasis and the link with theory, on the Matlab laboratories, and on the lectures. Areas where improvement is clearly needed are:

- Preparing assignments earlier. In Spring, this will be addressed by... preparing the assignments earlier...
- More support for Matlab. In Spring, there will be seven Matlab sessions in stead of five, so that should help. We will also need to provide links to longer tutorial materials.

(I'm surprised by this issue, as there was a lot of Lab time in which students could have *asked* for additional help, and the LDC sessions were very poorly attended, except right before an assignment was due. — JohnR)

- More worked solutions. OK, we will provide more worked solutions.

Overall, issues concerning preparation and clarity of expectations should be much improved the second time around.

7 Assessment

Figure 1 summarizes the assessment results for Autumn 2005. Of 62 students enrolled, 13 failed. Note, however, that six of those did not sit the final exam.

There were two appeals lodged, one of which resulted in an additional oral assessment, and a change of mark from 45Z to 50P.

The mean is 56.3, counting the students who did not sit the final, and 60.9, if those students are not counted. Overall, I think the mark distribution is quite acceptable.

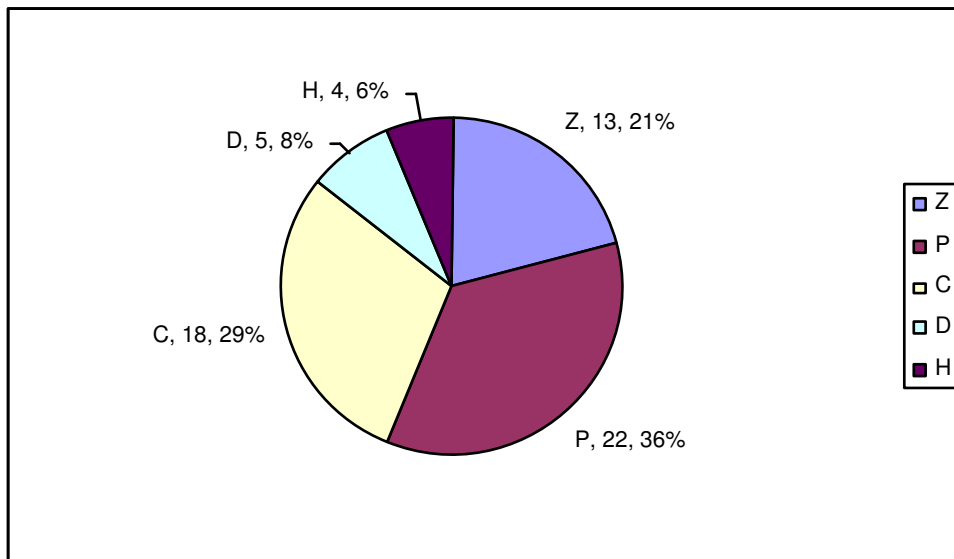


Figure 1: Assessment summary, Autumn 05

8 Postscript

As of the completion of this report, Spring semester is well under way (week 3). The first assignment (of three) was handed out in week 2, and students are already formed into teams (pairs) for the teamwork part of the assignments. Course materials are all prepared on time, and students that are attending the class sessions appear to be engaging well with the subject.

We have revised the assessment structure to remove unnecessary points of contention, and reduced the number of course modules from six to five, to allow room for the mid-term and for exam preparation. We have reduced the number of tutorials and increased the number of Matlab sessions—in particular in the second half of the subject—as that is where we perceived students would get most benefit.

There are still some issues with student attendance: a dozen students have not registered a team for the assignments, because they have been absent from the tutorials. I will be trying to get these students to either smarten up, or withdraw, in the next week or so.

So far, so good...