

STATEMENT OF TEACHING

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I really enjoy teaching. I find it to be an enormously rewarding experience with instant dividends as one sees the faces of students light up as they understand the key concepts. I like to consider myself as a conscientious teacher who works hard to impart the key ideas and concepts as well as keep a large fraction of the students engaged.

I have taught three different undergraduate classes and three different graduate classes. For the undergraduate students I have taught Basic Circuit Theory, Signals and Systems(thrice), and Advanced Engineering Mathematics. For the graduate students I have taught Random Processes, Theory of Probability (measure theory based), and Network Information Theory (twice).

TEACHING SIGNALS AND SYSTEMS - MY EXPERIENCE AND EXPERIMENTS

Teaching an undergraduate class in Hong Kong has been an interesting challenge to me. In my first offering of Signals and Systems, I assumed (based on my experience) that students had seen complex numbers and calculus in their school curriculum. After all, they were supposed to be ready to learn various transforms. When I was teaching there were some genuinely interested students and very talented students who have represented Hong Kong in the math Olympiad and some very bright students from China. They kept asking detailed questions which made me delve into the deeper and more delicate mathematical issues in class, which I enjoyed very much. It was only later in the semester did I realize that most of what I was saying was only absorbed by a very small number of students in class, while the vast majority of them did not have the mathematical background. In the end, the diversity in the ability was way too much to keep everyone motivated; and I would say that there was a genuine mismatch between the audience to whom the lecture was aimed at and the actual audience. The pass mark was about 15 percent (even though exams were of the same standard as exams in my undergrad institution and the highest marks were close to 90 percent) and even then many failed the class.

Hence after one year of attempting the impossible, I asked that the class be split informally into an elite version and a regular version. To provide an incentive for the good students to take the elite class, I said that they would have common exams and common grading with the regular class, except that I will cover more advanced concepts in the elite class. This experiment turned out to be a success for both the sections of the class and such a system is being carried out informally in the subsequent years. Of course my course evaluation scores also improved as a result of this experiment.

The third year, the department had Prof. Lian Kuan Chen teach the majority of the class and I taught a more mathematically mature version (the informal elite version) with few MIE students and the whole BME class. The two classes had common exams and common grading. In my opinion this was a very good compromise. The majority of the IE students liked Prof. Chen's teaching (even though his evaluation scores were roughly similar to my second year scores) and the BME students seemed to appreciate my teaching as well. (As expected, my evaluation score on this class of fifty students was higher than my previous scores as well as Prof. Chen's class with one hundred and twenty students).

- In my first year of teaching signals and systems the exams were open book and open notes. I wanted to test them on the concepts and not on their memorization abilities. To my surprise, the unmotivated students believed that they could learn things on the fly during the exams from the notes and textbook. Only in the exams did they realize that I was not asking questions to which they could just find the answers and that they had to understand the concepts and apply them.
- The next year I tried open notes. This was slightly better but then my exams had got a bit of notoriety as well. It is not that I try to set hard questions but I try to invent new questions for exams and hence it is unlikely that they would have seen it earlier. Therefore a lot of students found exams difficult as they seemed to be used to having exam questions similar to their homework assignments (a frequent gripe in their comments).
- In the third year, Prof. Chen and I resorted to open formula sheets only and this was about as good as open notes. The exams were made a bit easier but we realized that students without the required background still struggled very badly no matter how easy the exam was. The pass mark was again about 15-20 percent of the written part (not counting the marks for homeworks).

I very much sympathize with students whose mathematical background is quite weak. I find it quite disconcerting that students with no calculus and complex numbers background are thrown into a differential equations class or a signals and systems class that is supposed build up on their calculus knowledge. *This mismatch between the curriculum and the background of the students has made the teaching aspect of foundational math classes a lot more challenging.* It was very demanding to attempt to keep everyone, the best and the most challenged, interested and motivated. I am glad that the new 4-year curriculum is attempting to mend this issue.

It was indeed a baptism by fire and I would have not enjoyed the experience any other way.

GRADUATE CLASSES

I had to introduce new courses to train my students to be able to conduct good quality research. I have had very nice experience with teaching the graduate courses. Indeed as some of them were advanced graduate classes, I got the opportunity to work hands-on with some of the students for their class projects, which has indeed produced some nice new results. In general my teaching philosophy is to emphasize the concepts and discourage rote memorization. Hence I often have open book exams and take home exams in these classes.

I developed three new classes during the past five years. I developed a class in random processes (temporarily replaced by another version of Prof. Bob Li), a class in probability (usually offered by the math/stat departments but not offered in CUHK) and I developed a network information theory class. I intend to offer the latter two classes every alternate years; and have already made two offerings of the network information theory class and one offering of the probability class.

SUMMARY

My teaching attitudes have been inspired by a lot of the great teachers I have met in my career. I like Tom Cover (for his 'digressions' into interesting examples), Abbas El Gamal (for his meticulous preparation), Stephen Boyd, Amir Dembo (for his homeworks where he drilled down the fundamentals), Siegmund (for showing a different perspective to teaching probability than Amir Dembo), and Persi Diaconis (for the sheer diversity of the courses he taught and the entertainer that he is). In short, teaching is a labor of love and it is something that I tremendously enjoy doing.

STUDENT SUPERVISION

Here is a list of graduate students whom I have supervised and am supervising:

1. Zizhou Vincent Wang¹ (Ph.D. July 2010). Currently employed with Altai Technologies limited (Science Park) as an engineer with research responsibilities,
2. Yanlin Geng (Ph.D. July 2012). He is going to do a year post-doc with me to wrap-up a few items and get a bit more mature. He will then look for post-doc positions elsewhere before an eventual transition as an academic,
3. Lingxiao Xia - 3rd year Ph.D. student,
4. Sida Liu - 2nd year Ph.D. student

I have also worked with the following students in various other capacities.

1. Amin Aminzadeh Gohari - post doc (for 5 months funded by INC). He got his Ph.D. from U.C. Berkeley and after his post-doc joined Sharif University as a faculty member. I continue to have active research collaborations with him,
2. Varun Jog - summer intern. He did a summer intern when he was an undergraduate student in India. We did some nice work together and now he is a Ph.D. student in the EECS department of U.C. Berkeley,
3. Arvind Ramachandran - another summer intern from India. He joined Qualcomm in India after his bachelors,

I have also had some of the bright undergraduates here do informal research projects with me. This list includes Liu Ding and Yin Zi (currently a final year undergraduate). I have also supervised a number of FYP students during my time here.

¹In official capacity I was his co-supervisor and his supervisor was Prof. Bob Li. However Vincent did all his doctoral research working on problems with me.