SUMMARY OF TEACHING ACTIVITIES: 2002

Spring 2002

In Spring 2002,I taught *Physical Measurement and Instrumentation (PHYS636*). I had taught this course at my previous position at Clarion University, albeit in a different format. The course covers both analog and digital electronics with a vast array of topics. The emphasis is on hands-on experimentation (nearly 50%) of the course.

For the most part, I followed an outline very similar to that designed by Dr. Brett DePaula who had been teaching the course previously. There were a few minor changes, however.

- In addition to using hands-on activities, I used computer simulations. The computer simulations provided a good supplement (*not* a substitute) to hands-on activities. Computer simulation, in industry, is often an important step in the design of electronic components and circuits. Virtually no circuit would be built without first being designed. Therefore, I felt it was imperative for students to learn the skills needed to simulate a circuit.
- As the course proceeded, I integrated the lecture and laboratory components of the course more effectively that at the beginning of the course. Rather than meet for an hour of lecture on the morning of the day when there was a laboratory, we decided to extend the laboratory time and meet for four hours instead of three. Of course, students did not work continuously for four hours. There were frequent breaks. Also, this format allowed me to intersperse the lecture and discussion of the concepts in the lab. Often we would talk about a circuit, I would demonstrate the simulation, and students would build and test the circuit in the lab.

Student reactions to the course, in general were positive. However, there were a few complaints. First, students did not like the text. They felt it did not explain the circuits clearly and just presented the material to them. It would serve as an effective reference text, but not quite as well for those learning the material for the first time. I concur with students' assessment about the text. Second, students complained about the lack of working equipment. Both of these issues have been addressed in the course that I am teaching this spring.

I would like to thank Brett DePaula for his useful advice in teaching this course, and also for his excellent Laboratory Manual. I will use several, if not all of the laboratory exercise in this manual when I teach the course again this spring.

Fall 2002

In Fall 2002 I taught two courses *Physical World – I (PHYS101*) and *Engineering Physics – II Studio (PHYS204)*. I was also responsible for organizing the *Physics Education Seminar (PHYS807)*. I describe my experiences in each course below.

Physical World – I (PHYS101)

This semester was the second time I taught this class so I incorporated what I had learned from on my experiences as well as from student and faculty feedback from the last time. I made the following changes:

- I had used the Personal Response System (PRS) last time. However, this time I assigned 15% of the course grade to class participation that was ascertained from student responses on the PRS. One of the anecdotal observations as a result of this change was increased class participation even on questions that were *not* asked using PRS. Students seemed to be more

likely to ask and answer questions in class than they were last semester. Of course, it could possibly be that this was a different group of students, but somehow, I suspect that the PRS system made students feel more empowered to interact in a large enrollment class.

- When students responded to questions on the PRS, I walked around with a seating chart primarily to check who was absent, but also to make myself more accessible to students. I felt that my walking up and down the aisle as students discussed and responded to questions on the PRS made me more accessible to them. Often students would stop and ask me a question or clarify a difficulty that they otherwise would not have felt comfortable raising in class. Also, it gave me the opportunity to learn students' names and get to know them better, which is always a challenge (at least for me) in a large lecture class.
- I also increased my use of computer animations – particularly *Physlets*. These *Physlets* were embedded in the lectures (or could be accessed separately as well) and were aimed at clarifying some of the concepts. A few of them tied in with demonstrations (e.g. Hunter and monkey), and a few were self-standing. I have not done a formal study on how effective these were in enabling students learn but I do have some anecdotal evidence (students asking me to re-run an animation in class and students telling me they visited it on the website to help answer a homework question), that indicated that they were helpful. Based on this positive feedback, I will try to incorporate them more extensively next time. It should be possible, to ask students to use physlets in answering homework questions.
- This time I also covered more material! Surprisingly for me, I was able to make the class more interactive (as described below) and at the same time cover more topics. I suspect this was because I had a better sense of what I could spend less time on, and what needed more time, based on my experience from last time.

Other "non-standard" features of this course, which I retained from last time, were the extensive use of K-State Online. This allowed me to have students do homework without use of a human grader. Students seemed to appreciate the easy access to lecture notes (posted after the lecture), summaries and other information. Overall, I enjoyed teaching this class even more than I did last time. My student evaluations were also more positive than last time.

I would like to thank the following faculty members for their useful advice in teaching this course (listed alphabetically by last name): Tim Bolton, Amit Chakrabarti, Chris Sorensen and Dean Zollman.

Thanks are also due to Peter Nelson and Mark Newman for their invaluable help in suggesting and setting up lecture demonstrations, often at short notice.

Engineering Physics –II Studio (PHYS214)

This was my first experience teaching Studio at K-State. However, I was familiar with the Studio concept, and had taught in an interactive environment previously. Therefore, I was quite excited at the prospect of teaching Studio.

The found the Studio environment extremely conducive to interactive engagement with students. Students enjoyed being able to explore the concepts hands-on and having the opportunity to work with their peers on problem solving.

I incorporated the following "non-standard" features in my teaching of the Studio.

- Use of the K-State Survey System. This feedback tool was extremely valuable in finding out what students understood and what they did not, *before* I went into the Studio each day. I put up a survey on the system that queried students about the difficulties that they were having on each of the assigned homework problems. Students were asked to rate the difficulty of each problem on a 5-point scale. They were also asked to describe specific aspects of the problems that they found difficult. This was useful in figuring out which problems to focus on in my discussion and what concepts students had difficulty with on that day. I would certainly continue using the survey system if I were to teach Studio again.
- I supplemented some of the hand-on activities with *Physlets*. At times students were explicitly asked to visit the website and use the physlet to test their prediction regarding a physical situation (e.g. location of an image due to a lens, shape of electric field lines). Other times, students were simply pointed to the physlet with no specific task being assigned. The first approach was clearly a more effective use of physlets. I would try and incorporate these more effectively if I were to teach Studio again.

Physics Education Seminar (PHYS807)

This course assignment may not traditionally be considered teaching, since it overlaps quite significantly with research. However, in a sense, it could also be considered "training" or "apprenticeship" of new inductees (graduate or undergraduate) students in this field.

In this spirit, I organized the seminar a little differently from the way in which it was organized previously.

- We capitalized on the broad diversity of our students' educational background by asking students from various background to describe the educational systems in their native countries and compare them with those in the U.S. This exercise provided a broad perspective or the issues faced by secondary and higher education worldwide. It was also an effective way of getting new graduate students to participate in the seminar, rather than be passive listeners.
- In addition to the research talks given by members of our Group, we also discussed papers written by others. The papers chosen were based on topics relevant to those our Group is researching. They were a good tool to broaden the perspective of our group and also a forum for interaction. Our new graduate students were typically assigned the role of being scribes during this discussion.

While some of our efforts to increase participation of our new students may have been marginally effective much more needs to be done. I suspect that we will continue with the general format of discussing related work of people from outside our group but we will try to focus our future seminar series around one or a couple of broad thematic areas of research.