

Teaching Activities

My teaching philosophy is: motivating students to pursue new knowledge, and encouraging them to learn by themselves and for themselves. Teaching consists of three important components: instilling into students the fundamentals of a subject, equipping them with the tools necessary to build on top of the fundamentals, and most importantly inspiring them to go beyond the fundamentals and explore new worlds. The knowledge a teacher can convey to the students in a course is very limited; if she can inspire their interests in a subject, and teach them the right methods to solve problems in that subject, the effect will last their entire careers. Besides course subjects, I pay attention to training students the leadership, presentation skills, writing skills, and teamwork spirit. I think these capabilities will benefit the whole life of the students.

A. Courses taught

Electrical and Computer Engineering, SUNY at Stony Brook.

Year	Course Number & Title	Enrollment	Comments
Fall 2015	ESE 224: Computer Techniques for Electronic Design II	99	Existing
Fall 2015	ESE 505: <i>Wireless Communications</i>	16	Existing
Spring 2015	ESE 506: <i>Wireless Networking and Mobile Computing</i>	6	Existing
Fall 2014	ESE 224: Computer Techniques for Electronic Design II	102	Existing
Fall 2014	ESE 505: <i>Wireless Communications</i>	12	Existing
Spring 2014	ESE 506: <i>Wireless Networking and Mobile Computing</i>	10	Existing
Fall 2013	ESE 224: Computer Techniques for Electronic Design II	100	Existing
Fall 2013	ESE 505: <i>Wireless Communications</i>	22	Existing
Spring 2013	ESE 506: <i>Wireless Networking and Mobile Computing</i>	11	Existing
Fall 2012	ESE 224: Computer Techniques for Electronic Design II	78	Existing
Fall 2012	ESE 505: <i>Wireless Communications</i>	29	Existing
Spring 2012	ESE 506: <i>Wireless Networking and Mobile Computing</i>	24	Existing
Fall 2011	ESE 224: Computer Techniques for Electronic Design II	78	Existing
Fall 2011	ESE 505: <i>Wireless Communications</i>	24	Existing
Spring 2011	ESE 506: <i>Wireless Networking and Mobile Computing</i>	32	Existing
Fall 2010	ESE 224: Computer Techniques for Electronic Design II	59	Existing
Fall 2010	ESE 505: <i>Wireless Communications</i>	28	Existing
Spring 2010	ESE 506: <i>Wireless Networking and Mobile Computing</i>	9	Existing
Fall 2009	ESE 224: Computer Techniques for Electronic Design II	40	Existing
Fall 2009	ESE 505: <i>Wireless Communications</i>	28	Existing
Spring 2009	ESE 506: <i>Wireless Networking and Mobile Computing</i>	7	Existing
Fall 2008	ESE 224: Computer Techniques for Electronic Design II	45	New materials
Fall 2008	ESE 505: <i>Wireless Communications</i>	12	Existing
Spring 2008	ESE 224: Computer Techniques for Electronic Design II	42	Restructured
Spring 2008	ESE 506: <i>Wireless Networking and Mobile Computing</i>	9	Existing
Fall 2007	ESE 505: <i>Wireless Communications</i>	11	New curriculum
Spring 2007	ESE224: Computer Techniques for Electronic Design II	4	Existing
Fall 2006	ESE506: <i>Wireless Networking and Mobile Computing</i>	10	Existing
Spring 2006	ESE224: Computer Techniques for Electronic Design II	8	New course
Fall 2005	ESE506: <i>Wireless Networking and Mobile Computing</i>	15	New course

Computer Science and Engineering, SUNY at Buffalo

Spring 2005	CSE 646: <i>Wireless Networks</i>	15	Existing
Fall 2004	CSE 742: <i>Advanced Topics in Wireless Networks</i>	10	New course

Spring 2004	CSE 741: <i>Topics in Mobile Computing and Sensor Networks</i>	12	New course
Fall 2003	CSE 646: <i>Wireless Networks</i>	24	New course

B. Curricular development and impact

I enjoy teaching courses that combine learning about the foundations with gaining practical experience and exposure to the real-world problems. I particularly enjoy courses in which we analyze and compare existing real systems to uncover the fundamental issues that can be applied to future efforts.

Since joining Stony Brook, I am fortunate to have had the opportunity to create and teach a graduate course sequence in wireless networking and communications area. My effort includes the creation of the new course *ESE506 Wireless Networking and Mobile Computing*, and the curriculum renovation of the existing course *ESE 505 Wireless Communications*. ESE 505 is directed towards the theoretical underpinnings of wireless communications and basic network technologies. ESE 506 is an advanced graduate course which covers the recent wireless network techniques and standards, and new research results in the wireless networking and mobile computing field. This new course sequence intends to build the strength of the ECE department in wireless communications and networking area, and is in synergy with the university effort of establishing the Center of Excellence in Wireless and Information Technology. Additionally, to better prepare the undergraduate students to meet the need of the current society, I joined the efforts of the department in developing more courses in the software programming area. Specifically, I created the undergraduate core course *ESE 224 Computer Techniques for Electronic Design II*. I first give a brief introduction of each course, and then introduce my experiences and some methodologies I used for teaching a course.

- *ESE 224, Computer Techniques for Electronic Design II (new)*: This is an undergraduate core course which introduces C++ programming for problem solving in electrical and computer engineering field. Topics covered include: C++ concepts, classes, abstract data types, code reuse, basic data structures, object-oriented programming concepts as well as numerical techniques. This course intends to help the EE major students to improve their programming skills. During the lecturing, I notice that EE students often have low interest in programming, and are afraid of working on programming exercises. I help students to understand that computing technology is important for a future engineer to be successful in her career, and that programming would help solve a problem which would otherwise be not tractable. To help the students to better grasp the programming skills, besides assigning more programming exercises, I also introduce a new course project each year that requires the students to apply what they have learned in the course to solve a practical problem in team. The problem is divided into a set of smaller problems, and students are allowed to tackle some or all sub-problems. The difficulty levels of the sub-problems increase, and lower-level problems are building blocks of higher-level problems. The students feel the project can help them to exercise all the major techniques they learn in the class, appreciate the teamwork experience, and become more confident in programming.
- *ESE 505 Wireless Communications (new curriculum)*: This is a graduate course which involves lectures and a class project. It covers the first year graduate level materials in the area of wireless communications, including fundamentals wireless channels, modulation techniques, basic coding techniques, multiple access schemes, channel allocation, power control, accessing and scheduling techniques, resource management, handoff, and admission control. It also provides the design principles and basic analysis on cellular systems, including 2G, 3G, 4G and the recent 5G efforts. ESE 505 is an existing course. I have taken a new textbook which includes the state-of-the-art materials, and developed a completely new set of lecture notes. I have also provided additional materials to bridge the gap between the book and practical network systems based on my work experiences in Bell Lab research.
- *ESE 506, Wireless Networking and Mobile Computing (new)*: This is an advanced graduate course which involves lectures, class presentation, and a course project. The course examines the unique network protocol challenges and opportunities presented by wireless networking and host or router mobility. The course gives a brief overview of fundamental concepts in mobile wireless systems and mobile computing, covers in more details the system and standards issues including wireless local area networks (LANs), wireless personal area networks (PANs), mobile IP, ad-hoc networks, sensor networks, as well as issues associated with small handheld portable devices and new wireless applications. It is difficult for textbooks to track the rapid evolution of wireless networking technologies.

Besides providing various reference books and detailed lecture notes on fundamental techniques, I also use as course materials the articles appearing in top technical conferences and journals as well as popular magazines. The lecturing is followed by several topical studies around recent researches in mobile computing and wireless networking field, with the purpose of bridging the gap between advanced textbook material and the state-of-the-art research in the field.

To synthesize research with education, I designed different term-long research projects in ESE 505 and ESE 506 that allow the students to learn about the state-of-the-art advances in the field, and apply their classroom learning to solve real problems of the current wireless networks. In order to attack a problem, the students often need to thoroughly understand one subject area. The students are excited to find out a lot of knowledge introduced in the class are very useful for them to develop solutions. This further motivates their interests in wireless communications and networking, and helps them to better understand the fundamental concepts. The project topics are broad to accommodate students from diverse domains and with different interests. The students are also trained for presentation skills, basic research skills, team working skills, and technical report writing skills.

These courses have grown from a small class with a few students to popular courses of the department. The course ESE 224 has the student number increases from the initial 4 to the current capacity at 100 each year. The course ESE 505 reached capacity limit in many years.

I used to be asked by army research lab for providing a reference for one past student from my class ESE 224. After I introduced the way I taught the class and the student's behavior in the class, the ARL scientist told me these characteristics and training were exactly what they need from the student. The ARL not only gave the student the summer Intern opportunity, but would also like to sponsor the student for his PhD. The courses ESE 505 and ESE 506 cover the state of art wireless technologies. Many students obtained their summer Intern positions in telecommunications companies, and some of them were given job offers right after their Interns. With the offering of more wireless courses, I also notice the significant increase of applicants in communications areas over the years, which help the department to recruit more and higher quality graduate students.

C. Teaching methodology

Well-designed curricula and good methodologies are keys to success in teaching. I normally have a detailed syllabus and up-to-date course website that describe the scope and requirements of the course, provide tips for learning, include links to the fundamental materials that help build the foundation of the course, links to the advanced materials to be used in the class, and links to other reference materials for students that are keen to further explore the field. My courses generally balance fundamental materials and theory with state-of-the art technologies. Projects are very important for stimulating the students' interest on a subject, and helping them to better grasp the theories. For an advanced course, I normally allow a student to select from *four project styles*:

1. In-depth and critical survey of one research direction;
2. Systematically implementing, simulating, and analyzing an existing approach and making big improvements;
3. Revising existing methods to solve new research problems;
4. Identifying a novel research problem and proposing a solution.

I make students to understand that these four styles are actually the necessary approaches to solving practical problems, and that their projects will be graded differently based on the depth of the project. This not only stimulates the students' desire to fulfill their potential, but also allows a student more flexibility in selecting a project that fits his background and to feel rewarding.

Class attendance and discussion are important for the learning process. I have made an effort to make my classes more interactive and interesting. I often raise questions when presenting materials related to what was taught earlier or before presenting new material. This helps students to understand the relationship between different concepts, and increases their interest in new material. In order to draw less active students into class discussions, I intervene as little as possible, and mostly encourage students to freely express their ideas and correct each other's mistakes. I also ask students to turn in questions and criticism on the class presentation materials after

each class. I also provide chapter quizzes to help students to digest course materials and motivate their class-participation. I believe that this is an effective tool to maintain student attendance and participation, and to cultivate critical thinking.

Different methodologies are needed for undergraduate classes and graduate classes. Fundamental courses at undergraduate level present as big a teaching challenge as advanced courses, and require even bigger responsibility. A well-taught course creates a solid foundation for students, and may inspire some of them to continue with advanced studies. Equally, a poorly taught course can leave a permanent fundamental weakness in the students' knowledge, and can hamper them in their professional careers or discourage them from pursuing advanced studies in that field.

For undergraduate courses, instead of lecturing throughout the class, I often ask the students to volunteer to solve the problems on the whiteboard based on the concepts I have introduced. I would ask the class students to check the solutions. This exercise is for several purposes: attracting the students to focus their attention on the class lecturing, helping the students to grasp the basic concepts in depth, stimulating their interests in a subject, and training the students to have the self-confidence and apply their knowledge to solving the problems quickly.

For a graduate course, I also pay attention to training the students to grasp the basic skills. Besides course materials, I also give out articles on how to read, write, and present research papers, as well as sample slides from previous students. After a student presentation, the students and I discuss what to learn from a speaker, and what to avoid. To help students to improve their writing, I often allow students to modify and re-submit their term reports multiple times. During this process, I try to get them to better organize their ideas into the format of a technical report, and present their ideas clearly. I believe the long term benefits of effective communication abilities are worth the extra effort for me and for the students.

I believe that showing that I care about their learning process is the most effective way to motivate the students and win their trust. Besides normal office hours, I make appointments with students who could not make office hour or need urgent guidance, and exchange emails with them responsively. I also hand out mid-semester evaluation forms to get feedback about the course so that I can better adjust the course to meet student needs.

D. Quality of in-class teaching

E. Student supervising

Apart from teaching, I also supervise graduate thesis and research projects for both graduate and undergraduate students. I think it is very important for a PhD student to be able to work independently, and being able to identify the research problem is the important first step. Instead of simply assigning a problem and forcing the students to work on the topics I choose, I try to find the best way for each student to enter the research field based on her background and interest. For students that have difficulty starting their work, I pick some sample papers to study with them, showing them how to identify and attack the problems. I also do not modify a student's paper directly. Instead, we discuss where and how to make changes, and generally go through several iterations. Even though this may be a slower approach, I believe this training process is worthwhile, particularly in terms of training their capabilities in pursuing high quality research. As the result, my students can normally learn to write high quality research papers within two years' of their entrance to the PhD program. My first PhD student had his first two papers accepted by IEEE INFOCOM, a top networking conference. Two other students had their first papers published in the highly competitive ACM MobiHoc and IEEE ICDCS.

Besides supervising PhD students, the graduate courses with research projects also require a significant amount of supervisory effort. I have tried to arrange the projects to meet the students' interests and their knowledge level, and work with them closely. The importance of experimental work is also emphasized in both lectures and course projects. Already, students have produced some interesting ideas during classroom discussions and project work, some of which have resulted in technical papers. A number of students have been drawn towards wireless research during the course, and extended their course projects into their degree work. I also supervise many

students with interests in wireless networking areas for independent studies. Lately, I start to open my lab to undergraduate students. I hope this would give the students some exposure to practical problems, and help them to have more effective studies in their future courses. Most importantly, I hope by increasing the opportunities for undergraduate students, we could attract more and talented students to the engineering areas and to Stony Brook.

To promote diversity in education, I have made special efforts to support *underrepresented* students and students with *disabilities*. 2/5 of my PhD students graduated were minority, and had excellent performance in their research and course work. A minority undergraduate student who was in my class of ESE 224 of Spring 2008 had hearing problem. I had provided her special help in the class, and patiently answered each of her questions. With her hard work and my help, she got an A- in the class.

F. Conclusion

I enjoy and would like to continue working on educating the future generations of scientists and engineers. My extensive academic and industrial experiences provide me with a good background for advising students at all levels. Besides equipping them with knowledge and skills, I would like to inspire them to be creative, independent, and responsible. I have successfully supervised two minority PhD Students and a few minority MS students for projects. As a minority faculty, I often share my experiences with students and I hope to encourage more minority students to study engineering and science, and perhaps to pursue advanced studies.