Murat Yuksel
yuksem@unr.edu

TEACHING STATEMENT

Teaching Philosophy

I can summarize my teaching philosophy and methodology in three mottos: *motivation*, *individual attention*, and *balance*. In many cases, lack of motivation makes students find it tedious to learn a concept. Before teaching a concept, specific applications of it or benefit of learning it for more advanced concepts with certain applications must be illustrated in the class. This motivation problem has been the main cause of the high freshmen dropout rate in science, technology, engineering and mathematics (STEM) disciplines. I strongly believe that freshmen and sophomore survey-style courses with industrial and real-world application demonstrations must be part of the curriculum in science and engineering. Before the students get exposed to the fundamental theory, they need to be informed of the use of these fundamentals.

Another important component of successful teaching is to pay individual attention to students and make sure they do not feel lost in the crowd. Office hour availability and friendly approach to the students are part of implementing individual attention. I believe meetings by appointment must be part of every teacher's schedule, as students may need individual time with the professor in addition to regular office hours. I heavily use communication tools like WebCT to establish discussion forums to foster dynamic involvement of individual students.

As the last point, not all students are at the same level naturally; thus maintaining motivation of students with high variety in quality is a difficult task. Balance of course subjects, homework, projects, and exams must be very well adjusted; so that the best and the worst students of the class feel the same way in working towards the course material. Giving easy assignments makes the course may seem successful in numbers, but the good students will not be that motivated for working on the material which is a loss for the course, the instructor, and the department. However, giving very hard assignments discourages low performing students from the course. A balanced approach is necessary so that exams and other assignments include both hard and easy giving similar challenges to different sets of students in the classroom.

Past Teaching Experience

After tutoring high school students for quite some time during my undergraduate study, I have been involved in teaching graduate and undergraduate college courses for more than thirteen years (3 years as teaching assistant and 12 years as instructor). Teaching concepts to students, and seeing the students apply these concepts fascinate me. For the first two years after my B.S. degree in Computer Engineering, I taught introductory-level computer engineering courses at a newly founded university, ITTU. Because of my passion for teaching and education, I did not have any hesitation joining a newly founded university as an instructor. Later during my graduate studies at Rensselaer Polytechnic Institute (RPI), Troy, NY, I worked as a teaching assistant in the CS Department for three years. I conducted office hours, graded exams, and delivered lectures when the professor was away. During my postdoctoral study at RPI, I have lectured two junior-level courses at the ECSE Department. Finally, I have been teaching several courses at the CSE Department of UNR with consistently high (all being 4+ out of 5) evaluation scores. Among the topics I have taught are **Networks, Operating Systems, Digital Design, and Signals and Systems**. Further information about past teaching activities are available through my website.

Teaching Interests and Plans

My teaching interests are in the general area of **computer systems** and would like to continue teaching undergrad or grad courses spanning **networking, operating systems, digital design, signals and systems**.

Attracting more students to and preventing dropouts from science, technology, engineering, and mathematics (STEM) fields have been a major challenge for the academic community and the country at large [1][2]. Engaging students into a specialty area such as networking should start as early as possible to reduce possibility of dropouts from STEM areas. An intriguing and challenging classroom environment is crucial to support student engagement in STEM areas. Establishing such an environment requires that research advances to be integrated with educational instruction in the classroom. With this vision, my teaching interests and plan is centered on two goals: (i) development of role-playing activities *to make challenging networking and computer systems concepts easier to understand for non-experts*, and (ii) development of curriculum modules *to engage students early on with advanced networking research*.

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Network Role-Playing Activities: Though role-playing has been a major teaching technique for K-12 education [3], using role-plays for teaching advanced computer science and engineering concepts is not a common practice. We have recently developed role-playing activities to teach senior-level operating systems concepts to UNR undergraduate students. The results over several semesters have been very promising [4]. The feedback from the students indicated that they understood the abstract and challenging operating systems concepts (e.g., multiprogramming, multithreading, concurrency, and synchronization) better while enjoying the role-playing activities very much. I plan to *develop role-playing activities for networking courses and teach advanced networking concepts (such as layering, indirection, virtualization, and encapsulation) via these activities.*

The nature of these role-playing activities will be assigning pre-defined tasks to individual students and asking them to act for their tasks. For instance, a student assigned as a "packet" will have a piece of paper including the source and the destination for the packet. Another student assigned as a "router" will receive such packet students and process them by telling them which next router student they should be going to. Other students acting for different and potentially conflicting applications will interact with student routers and develop strategies to achieve its end-to-end goals. I believe that such physical role-playing of network components will give the students the opportunity to "feel" what it is to function as part of a network and gain a much deeper perspective into how networks work in comparison to a lecture-based class environment.

***A Gateway to Advanced Systems and Networking Courses*:** Engaging students into a STEM specialty area (e.g., networking, computer vision, games) should start as early as freshmen year to prevent potential dropouts. Freshmen level introductory courses and sophomore level gateway courses are great ways to engage the students early on. One of my primary teaching endeavors is to establish, a chain of networking courses and achieve undergraduate involvement in my research through these courses. This chain should start with a gateway course serving "systems" courses (e.g., networking, architecture, parallel computing, operating systems) at the sophomore level. We have achieved a lot of this course chain at UNR, but more remains to be done, which I plan to pursue in the next coming years.

***Experimental Networking Course*:** A very effective way of attracting undergraduate students in advanced research and graduate studies is to engage them into hands-on research activities during their junior or senior years. I plan to offer a course, Experimental Networking, with many programming and hands-on short projects using tools suitable for advanced networking research. Most of these tools (e.g., ns-2, EmuLab, PlanetLab, SSFNet) typically involve pretty complicated simulation and emulation modules, and graduate students take sometimes months to effectively use them. These short projects will be a little more difficult than a simple tutorial and give the undergrad students the taste of "accomplishing something" while they are playing with a complex tool. The longer-term benefit will be more undergrads going into graduate programs and up-to-speed graduate students who are ready to perform the advanced networking research with a minimal learning curve.

References

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[4] M. Leverington, M. Yuksel, and M. Robinson. Using role-play for an upper level CS course. *The Journal of Computing Sciences in Colleges*, 24(4):259–266, April 2009.