

# Eric Freudenthal

## Statement of Teaching Interests

The rewards that come from mentoring students are major motivations for my choice to pursue an academic career. I have engaged students both in lecture courses (MS-level OS) and in research projects. In all cases, my approach has been to provide the necessary background to allow students to thoughtfully design solutions to interesting problems. This document describes my orientation and experience teaching formal courses and engaging students in research activities.

### Formal Courses

When teaching Operating Systems to MS candidates, I fashioned new lab assignments that more closely resembled typical “systems” design challenges than is traditional for their academic program. These labs generally involved both the writing of low-level code and evaluation of the interaction of algorithm and system behavior. Unlike the labs typically assigned for this course, I chose to neither define strict input/output requirements nor validation test sets. Students were encouraged to collaborate via the class email list on all parts of the assignments except for writing of their own assignments. While initially confused by the unexpected lack of structure, students quickly rose to the challenge of defining interface standards to facilitate their collaboration and then proceeding to design and evaluate appropriate test sets and experimental methodologies.

My focus in teaching algorithms for system applications was oriented towards the students learning a variety of approaches (and their respective trade-offs) rather than requiring them to memorize minute details of various alternatives. While they must be able to recognize faulty algorithms (for example, detecting race conditions), my exam questions are generally designed to determine whether students understand relevant design trade-offs through the diagnosis and remediation of degenerate failure cases caused by inappropriate choices.

I enjoyed teaching OS at the MS level and probably would particularly enjoy teaching courses in parallel and distributed systems, networks, and architecture. In both junior and advanced courses, I would stress the importance of appropriate algorithm selection and design models.

I am interested in designing and teaching a hands-on embedded systems or robotics course that includes a survey of the needed background in electrical design. Such a course would prepare students for designing simple interfaces, and enable them to work closely with electrical engineers on more ambitious designs.

I would also find teaching more basic data structures and algorithms courses very engaging. In these courses, I would be careful to describe motivational problems that illustrate the substantial impact of structure and algorithm choices on system behavior.

If needed, I could teach first courses in compilers and language surveys, though they would require more preparation and would be harder for me to motivate since my primary interests lie elsewhere.

As is appropriate for more advanced “Special Topics” courses, I would include surveys of relevant recent research, and assign projects that demonstrate a mature understanding of the problem area. Potential lower-level projects would include validation of results published by others, potentially providing background and frameworks for future research. More advanced students would be encouraged to directly propose new hypotheses that require non-trivial evaluation and could lay the groundwork necessary for designing a dissertation topic.

### Engaging Students in Research

I have included several groups of undergraduate and MS-level students in my research efforts. I engaged groups of students with little relevant computer science background in the construction of a thirty-two processor distributed system testbed that is now in continuous use by our Parallel and Distributed Systems

Research Group. More advanced students have constructed and instrumented significant components of research systems.

I encourage students to view their involvement in research as an alternative form of coursework rather than as employment. I regard students who consciously choose to support laboratory work as a learning experiences as apprentices, ideally acquiring skills and experience necessary to succeed at their new vocation. I consciously reinforce this message so that students are better able to weigh the benefits of available short-term research and employment opportunities.

Students tend to enjoy learning together and teaching each other, so I typically invite students to begin participating in a project in peer-groups. I have chosen assembly and configuration of prototypes and user tools, data collection, or the generation of system documentation as initial tasks for such groups since they are of practical utility and quickly familiarize students with portions of the research project and other research personnel. Some students progress to designing their own efforts that they partition among themselves or build and evaluate individually.

A group of undergraduates who contributed to the construction of a security-aware middleware system were jointly awarded honorable mention at a university-wide undergraduate research conference. One of these students subsequently presented his work at a DARPA-sponsored student research conference on distributed systems. The two students from this group who applied to graduate school were admitted to highly competitive doctoral programs. I am also pleased that all Masters' candidates who have worked with me found competitive and fulfilling job placements or migrated to doctoral studies.

I consider teaching and mentoring integral to my research. My personal creativity is frequently increased through the process of teaching the art of system design. It has been deeply gratifying to help these students mature into colleagues with whom I have enjoyed collaboration.