Teaching Philosophy and Interests

My teaching philosophy incorporates two core beliefs: 1) effective communication between instructor and student is vital, and 2) learning in engineering is an iterative process of theoretical study and application. It is through these principles that I reach my teaching goal—to provide an environment that allows students to take initiative in their education, and in which every student, regardless of background, comes away with an understanding of core mechanical engineering concepts.

I am interested in teaching a broad range of engineering material and have particular interest in topics related to solid mechanics and computational methods. My teaching is influenced by my research work in applied mechanics, plasticity, optimization, computer aided design, and the finite element method. I have served as the instructor for Design and Analysis of Structures at Syracuse Univeristy and for Engineering Dynamics at Rensselaer Polytechnic Institute with very positive student feedback in both cases.

Communication. As an instructor, I am responsible for the clear and deliberate communication of course material. This begins with the identification of course goals, taking into account student status, background, and destination. Next is perhaps the most important stage, the thoughtful preparation of course materials. My experience has shown that careful and thorough preparation is the most important effort I can make toward a successful class experience. This involves the distillation of material from a broad set of sources into a well organized lecture emphasizing key concepts. Well organized must not be mistaken for rigid, however. The ability to recognize the underlying nature of students' questions, and to respond accordingly, is vital to effective teaching. An example from my own teaching experience is the presentation of tensor invariants. Students who struggled with this concept frequently asked questions regarding mathematical details, but it was clear to me that they were failing to grasp the key underlying concept. These students benefited when invariants were presented in terms of the basic physical principle that the underlying states of stress and strain in a material cannot change as a result of rotating the coordinate system.

Learning as an iterative process. My lecture and exercise preparation is driven by the idea that learning in engineering is an iterative process of theoretical study and hands-on application. My own understanding of engineering material stems from the cyclic process of expanding on theory in the literature and applying it to problems in computational mechanics. Modern finite element software provides an example of how this process can be applied to teaching; theoretical concepts from the classroom come to life when students apply them to solve problems with these software tools. I intend to bridge my teaching and research when appropriate in accordance with this approach. Seeing state-of-the-art engineering tools being applied to solve real-world problems can foster interest in a subject. In academia, as in industry, students should ultimately be evaluated based on their creative ability to apply concepts for the solution of engineering problems. An iterative approach to teaching cultivates these talents and develops the fundamental skills required for competent engineering.

Specific teaching interests. I would be glad to teach a broad range of topics in mechanical engineering, with a general focus in solid mechanics and computational methods. Examples of specific undergraduate material include statics, dynamics, strength of materials, engineering design, and computational methods. I am also interested in introducing new students to engineering through classes such as Introduction to Mechanical Engineering and Introduction to Engineering Computing. My interests in teaching at the graduate level are tied to my research work in applied mechanics. Specific graduate-level teaching interests include solid mechanics, optimization, finite element analysis, and parallel-computing methods.