

Master of Science in Science Education

Montana State University

Course Description:

PHYS580 (2cr.) Teaching Mechanics Using Research-Based Curriculum

Location: A.J.M. Johnson Hall 121

Lab Fees: None

Class: MTWRF 9:00am to noon and 2:00pm to 5:00pm

The goal of this five-day course is to prepare participants to teach an integrated course built around *Tutorials in Introductory Physics* (McDermott, et al.). This research-based curriculum was designed to be used in recitations to augment traditional lecture courses operating essentially independent of the lecture. As a test site for this curriculum, Francis has taken the next step by totally redesigning his courses so that the lectures in fact serve to supplement the tutorials. The course will model both the student-centered tutorial instruction and the supporting active-engagement lectures for a selection of topics from the first semester of the two-semester sequence. A special emphasis will be placed upon training of peer-instructors for the effective use of the Tutorials. Participants will receive 70 PowerPoint lectures, each with its own description and learning outcomes, designed to engage the students in active learning and provide the necessary links to the Tutorial experience. A complete description of supporting demonstrations will also be provided. Finally, participants will receive a large bank of research-based homework and exam questions designed specifically to elicit the common misconceptions addressed in the Tutorials.

Instructor: Dr. Francis is the director of the Conceptual Astronomy and Physics Education Research (CAPER) Team in the Department of Physics at Montana State University where he teaches algebra-based physics in classes of up to 210 students per section. Over the last several years he has developed a relatively low-budget high-impact program of physics instruction that is producing gains on the Force Concept Inventory (a widely used test of conceptual understanding in basic mechanics) that are as good or better than lab-based programs that, by their design, require resources that are simply not available to many physics instructors. In addition, a study demonstrating a high long-term retention rate (“Do They Stay Fixed?” *The Physics Teacher*, 36(8), p. 488 (1998).) suggests that the program is doing much more than training them to give the right answers—it is changing their world view

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