

## **Introduction to Physics Education Research and Development (PER&D) August – November 2016 at HBCSE, MUMBAI**

Title of the Course: Introduction to Physics Education Research and Development (PER&D)

Instructor/Coordinator: Rajesh B. Khaparde

Day and time: Every Wednesday, 2.00 pm - 4.00 pm

Credits: 2

Outline of the Course:

The course will be based on the Physics Education Research and Developmental work reported during last three decades through major journals and books. The course will begin with an introduction to important aspects related to curriculum development, assessment, classroom and activity based physics education, and a few other issues in teaching a learning of physics at school and university level. During the course, some important and well accepted strategies of instruction (e.g., active learning, guided discovery, problem solving) and evaluation will be discussed. Details of some major projects in physics education (e.g., workshop physics, real time physics, physics by inquiry, ALOP, modeling instruction, FCI etc.) will also be presented.

The course will also have presentations on teacher training, development of procedural understanding, experimental problem solving and designing of laboratory courses. The course will have discussions on the work carried out during past two decades at HBCSE.

The course will involve classroom interaction, assignments (based on possible extension of R&D work to other areas in science) and reading sessions on some important publications. The assessment will be based on continuous evaluation, presentations and end semester test.

Readings and References:

- 1) Lillian C. McDermott and Edward F. Redish, Resource Letter: PER-1: Physics Education Research, Am. J. Phys. 67, 755 (1999)
- 2) R. Gott & S. Duggan 1995. *Investigative work in the Science Curriculum*. Open University Press.
- 3) Paula R. L. Heron and David E. Meltzer The future of physics education research: Intellectual challenges and practical concerns, Am. J. Phys. 73, 390 (2005)
- 4) Rajesh B. Khaparde, H. C. Pradhan, *Training in Experimental Physics Through Demonstrations and Problems*, First Edition, August 2009, ISBN: 81-87972-34-3, Penram International Publishing (India) Pvt. Ltd., pages 353.

- 5) Lillian C McDermott, Oersted Medal Lecture 2001: “Physics Education Research—The Key to Student Learning”, *Am. J. Phys.* 69, 1127 (2001)
- 6) David Hestenes, Malcolm Wells and Gregg Awackhamer, *Force Concept Inventory*, *The Physics Teacher*, 30, March 1992
- 7) Ronald K. Thornton and David R. Sokoloff, Assessing student learning of Newton’s laws: The Force and Motion Conceptual Evaluation and the Evaluation of Active Learning Laboratory and Lecture Curricula, *Am. J. Phys.* 66, 338 (1998)
- 8) Dean Zollman, Millikan Lecture 1995: Do they just sit there? Reflections on helping students learn physics, *Am. J. Phys.* 64, 114 (1996)
- 9) J L Dockett and J P Mestre, *Synthesis of discipline-based education research in physics*, *Physical Review Special Topics, PER*, 10, 020119 (2014)
- 10) David Hestenes, *Modeling Theory for Math and Science Education*, ICTMA13: Education and Design Sciences.