

## **PHYC 696 Modern Developments in Physics Teaching**

### **Course Description**

Recent developments in secondary physics curricula, multimedia teaching methods, national and local trends in physics teaching, laboratory work, textbooks, tests. Prerequisite: permission of the department chairperson. A total of 3 hours of credit may be earned.

Not open to students who have credit in PHYCS 396.

This course is designated an official professional education course, and as such, must conform to the Ball State University Conceptual Framework for Professional Education.

### Expertise

This course prepares physics teachers to be experts in the field of physics teaching and learning. Students will become aware of the abundant body of research on physics teaching and learning, and use the information to guide their daily decision-making processes in areas of curriculum and instructional strategies. Students will become knowledgeable of commonly held misconceptions and the most effective means for identifying and addressing them.

### Engagement

Students who complete this course will develop commitments, dispositions, and competencies that lead them to energetic involvement with all aspects of potential learning situations. They will incorporate constructivist methodologies into their own teaching practices (e.g., by utilizing inquiry laboratory investigations) and seek to actively engage all students as they learn physics concepts and develop problem-solving and laboratory skills.

### Context

Students who complete this course will understand that multiple contexts operate in learning situations and greatly impact the effectiveness of any particular instructional strategy. They will examine physics education research in order to discover why students think as they do, how students acquire and construct knowledge, and how to best facilitate a learning environment that will lead to the greatest chance of success for all students, regardless of race, gender, socio-economic status, or cultural background.

### **Course Objectives**

This course seeks to provide specific instruction aimed at developing pedagogical content knowledge. Students who complete this course will become aware of recent physics education research that should guide decisions made regarding curriculum scope and sequence, instructional methodologies, effective and appropriate uses of technology, assessment, and inquiry methodologies for laboratory investigations.

## Course Rationale

Although most physics teachers enter the profession with a strong content knowledge and background, they most likely experienced little or no direct instruction in physics teaching and learning. The rationale for this course is to provide both experienced and novice physics teachers with a physics teaching methods course designed to facilitate their development into engaged educational experts who are sensitive and responsive to the contextual bases of teaching, learning, and development. Physics education research will guide the instruction in areas such as physics curriculum, the use of technology in teaching and learning, guided and unguided inquiry laboratory techniques, the role and use of assessments, the nature of science and its role in physics knowledge development, student misconceptions, and teaching for conceptual change.

## Course Content, Format and Bibliography

### *Content*

Through literature research, interactive engagement, laboratory activities, and lesson plan development, students will examine and apply physics education research in several areas:

- commonly held physics misconceptions and conceptual change strategies
- assessment techniques and their role in informing curricular decisions
- the proper use of technology currently available for physics teaching and learning
- the nature of science and its historical role in the development of physics knowledge,
- the value of inquiry methodologies in laboratory experiences.

### *Format*

This course may be offered during the spring and fall semesters, as a five-week summer term course, or as a week-long workshop. Sessions will include lecture, discussion, and laboratory work. Student work used to determine the student's course grade may include classwork, homework, laboratory activities and investigations, and research reports.

### *Bibliography*

**Teacher Education in Physics: Research, Curriculum, and Practice** (2011). Edited by David E. Meltzer & Peter S. Schaffer. ISBN 978-0-9848110-0-7

**Physics by Inquiry: Volume I** by Lillian C. McDermott (1996). ISBN 0471144401

**Physics by Inquiry: Volume II** by Lillian C. McDermott (1996). ISBN 047114441X

**Five Easy Lessons: Strategies for Successful Physics Teaching** by Randall D. Knight (2002). ISBN 0-8053-8702-1

**Teaching Physics with the Physics Suite** by Edward Redish (2003). ISBN 0-471-39378-9

**Targeting Students' Science Misconceptions: Physical Science Concepts Using the Conceptual Change Model** by Joseph Stepans (2006). ISBN 1-891022-07-5