**PHYS 381. Intermediate Mechanics for Science Education.**

**Course description for PHYS 381**

Intermediate Mechanics for Science Education. Credit 3 hours. Prerequisite: PHYS 222. A study of the fundamentals of mechanics. A course designed for students in Science Education. This course may not be used for a major or minor in physics.

**Course outline for PHYS 381**

1. Newtonian mechanics-single particle
2. Oscillations
3. Gravitation
4. The calculus of variations
5. Hamiltonian and Lagrangian mechanics
6. Central-force motion
7. Mechanics of a system of particles
8. Dynamics in a non-inertial reference frame
9. Mechanics of rigid bodies

**Objectives of PHYS 381**

The objectives below reflect components of the COEHD Conceptual Framework. The COEHD’s Conceptual Framework provides direction for the development of effective professionals. It is a living document that continuously evolves as opportunities and challenges emerge. The four components of the CF are the institutional standards used for candidate assessment in undergraduate and graduate programs. They are Knowledge of Learner (KL), Strategies and Methods (SM), Content Knowledge (CK), and Professional Standards (PS). Diversity and Technology are included in the assessment process as themes that are integrated throughout all programs in the educational unit (diversity) (technology).

The objectives of this intermediate-level mechanics course are:

- to better prepare high-school science educators to teach introductory physics, (KL, PS, SM)
- delve more deeply into the concepts introduced in PHYS 221 (General Physics): kinematics, the Laws of Motion, momentum, energy, and gravitation, (CK)
- provide more practice with applied mathematics in the context of physics. (CK)

This course differs from PHYS 332 (Intermediate Mechanics) in the relative weighting given during assessment to the two objectives of the course, development of conceptual understanding and development of mathematical technique. In this course the weighting will be approximately 60:40 in favor of conceptual understanding while in PHYS 332, the ratio is reversed.
It should be noted that the intent is to combine this course under a single instructor with PHYS 332, which covers the same topics so that the science education major may benefit in development of physical intuition from contact with the physics majors.

**Evaluation methods**

Student performance will be evaluated on the basis of homework and written examinations. Quizzes may also be used at the instructor’s discretion. As described above, the evaluation differs from that of PHYS 332 by the higher weighting given to conceptual understanding in PHYS 381.

**Teaching strategy**

The teaching strategy comprises both in-class and out-of-class elements. In-class teaching strategy includes lecture, demonstrations (both physical and computer-simulated), and discussion. Out-of-class teaching strategy includes reading of the textbook, and homework.

**Bibliography**

The textbook to be used initially for the course is the following:


Additional literature resources include the following:


